WEST FALMOUTH SEWER MASTER PLAN

for the

TOWN OF FALMOUTH, MAINE

JUNE 2017

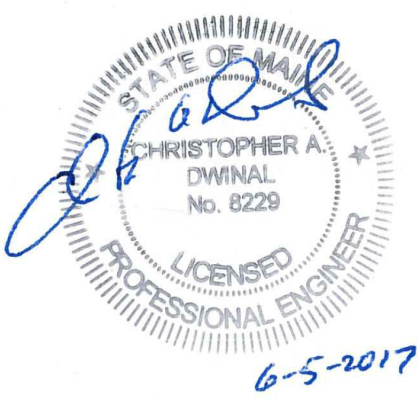
WRIGHT-PIERCE

Engineering a Better Environment

TOWN OF FALMOUTH, MAINE

WEST FALMOUTH SEWER MASTER PLAN

JUNE 2017



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WEST FALMOUTH SEWER MASTER PLAN

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EXECUTIVE SUMMARY

The Town of Falmouth, Maine is a highly desirable community bordering Portland that attracts significant residential and commercial development requiring wastewater collection and treatment. The wastewater collection and treatment needs for approximately half of the community is provided by a gravity collection system, 31 pump stations, and a wastewater treatment facility (WWTF) located off Clearwater Drive.

Over the past 45 years, growth in the wastewater pumping and collection systems has primarily occurred west of Interstate 295, the area called "West Falmouth" for the purposes of this study. A 2009 study to evaluate the Town's pump stations noted that current system bottlenecks in West Falmouth could become problematic when considering the long-term development potential, the number of times the wastewater must be pumped, and the distances wastewater must be conveyed to reach treatment. The Route 100 Vision Plan implementation and planned development projects in this corridor are examples of projects that will strain the Town's existing wastewater infrastructure.

Growth within the West Falmouth system puts stresses on downstream facilities, some of which are currently over capacity. The Town has recognized the limitations of its existing facilities. Therefore, the purpose of this Master Plan is to evaluate the potential for sewered growth in West Falmouth, develop a concept to provide sewer for this growth, and conduct a comprehensive review of the impacts on the existing sewer infrastructure. The study area is land west of Interstate 295. Efforts were focused on the Growth Area established in the 2013 Comprehensive Plan, with some exclusions agreed upon during discussions with Town staff.

The tasks undertaken to review the existing conditions of the Town's sewer system are discussed in Section 1, and the existing conditions of the system are described in Section 2. West Falmouth has 17 pump stations to convey wastewater to the WWTF. In the most extreme case, wastewater generated in West Falmouth must be pumped 8 times before reaching the WWTF. This highlights the importance of ensuring adequate capacity and redundancy exists within these stations. The existing conditions evaluation found two gravity interceptor sewers and several

pump stations near, at, or over capacity with current flows with either no, or very little, capacity for future growth.

Section 2 includes a list of tasks completed and documentation reviewed to assess the future sewer service needs for the Town. Possible future conditions are discussed in Section 3. In close coordination with Town Staff and the Long Range Planning Advisory Committee, the areas to be served by sewer in West Falmouth were established and estimates of flow were made based upon buildout using currently allowed and proposed development densities and estimated development suitability of parcels. Allowances for infiltration and peak flows were also incorporated. Possible sewer extension projects and pump stations were identified and cost estimates developed for each project. A sensitivity analysis was conducted to evaluate the reduced impacts if growth does not reach buildout. However, this analysis still found that, because a good deal of the wastewater infrastructure is at or over capacity currently, improvements are still needed.

Existing infrastructure needs and costs are discussed in Section 4 and recommendations are included in Section 5. In brief, the following infrastructure projects in West Falmouth are recommended:

1. Replace existing 8-inch diameter gravity sewer on Middle Road from Turnpike Spur to just upstream of Lunt Road Pump Station with 15-inch diameter gravity sewer
2. Increase pumping capacity of Falmouth Road Pump Station and reroute/extend force main from Woodville Road to Woods Road
3. Phase I Upgrade to Lunt Road Pump Station to increase pumping capacity
4. Upgrade to Middle Road Pump Station to increase capacity (if needed pending growth)
5. Phase II Upgrade to Lunt Road Pump Station for increase capacity by upsizing force main (if needed pending growth)

The cost of these improvements is estimated to cost between $3.7 million and $4.2 million for Projects 1 through 3 above. Projects 4 and 5 are expected to cost an additional $1.1 million, if needed.

The WWTF also has limits on the amount of organic load it can treat, and the amount of wastewater that can be passed through the facility without overtopping tanks, channels, etc. Increases in flow from the Mill Creek Pump Station (which is currently being upgraded) and the Lunt Road Pump Station upgrade recommended herein, as well as from the Clearwater Pump Station, will exceed the current hydraulic capacity of the plant. Further, the potential growth that can occur in West Falmouth alone (a flow and load equivalent to 2,000 homes) would more than double the remaining organic capacity at the WWTF. This is notwithstanding the potential for growth along the Route 1 corridor in both Falmouth and Cumberland which, through the Portland Water District, contracts with Falmouth for conveyance and treatment of its wastewater. Current estimates to upgrade the plant to increase hydraulic and organic capacity, and construct on outfall extension they could be required by Maine DEP if the Town requests an increase in the permitted capacity of the WWTF are $6 million. The Town may be able to buy some time before a WWTF upgrade is required by removing infiltration and inflow from the system to reduce flows during wet weather events.

Section 6 of the study report recommends suggests some changes to the Town's sewer use ordinance as well as presents options for funding of capital projects.

SECTION 1
INTRODUCTION

1.1 BACKGROUND

The Town of Falmouth, Maine is a thriving community of over 11,000 residents. Falmouth is a highly desirable community, just outside of Portland, that attracts significant residential development as well as retail business and institutional development. The wastewater needs for approximately half of the community is served by a large, gravity collection system, 31 pump stations, and a wastewater treatment facility (WWTF) located off Clearwater Drive that is licensed to treat a monthly average daily flow of 1.56 million gallons a day (mgd).

The Town's 2013 Comprehensive Plan update has identified the Route 100 corridor and other land areas where potential sewer growth may be desirable including some significant areas in West Falmouth.

Similar to sewer growth elsewhere, wastewater pumping and collection systems in West Falmouth have grown to serve new development or meet environmental needs. Beginning with the 1980's extensions to the Pleasant Hill area and the Woodlands, followed by extension to the schools, Route 100 corridor, Winn Road, and subsequently to the Falmouth Country Club, sewer growth has been directed to address current needs. Past study has noted that system bottlenecks are problematic when considered against the long term development potential in West Falmouth. Due to topography expansion of sewer in West Falmouth has resulted in a series of pump stations (i.e. station A pumps to station B which pumps to station C, etc.)

Sewer growth occurring at the far reaches of the collection system stresses downstream facilities. The Town has recognized the limitations of its existing facilities and the purpose of this Master Plan is to evaluate the potential for sewered growth in West Falmouth, develop a concept to provide sewer for this growth, and conduct a comprehensive review of the impacts on the existing sewer infrastructure.

In 2009, the *"Comprehensive Pump Station Assessment"* by Wright-Pierce evaluated the general condition and capacity of pump station infrastructure (23 pump stations at the time) and the capacity of select interceptors in Falmouth. One of the recommendations of that study was to conduct a more extensive assessment of growth potential and sewer capacity in Falmouth west of Route 295. Future recommendations on expansion of the system would be largely dependent on what development occurs and where. While the study area is west of 295, efforts were focused on the Growth Area established in the Comprehensive Plan.

1.2 SCOPE OF STUDY

This section includes a brief discussion of the scope of work involved in creating this Sewer Master Plan for West Falmouth. For the purpose of this study, West Falmouth is defined as the portion of Falmouth west of Route 295. The limit of the study area will be further refined later in the report.

1.2.1 Review of Existing Conditions

The following is a list of tasks completed, and documentation reviewed, to identify existing conditions during preparation of this Plan. Existing conditions of the Town's sewer system are discussed in Section 2.

- Reviewed the Town's 2013 Comprehensive Plan to help develop a sewer master plan that is compatible with the Town's plan for smart development;
- Held meetings with Town staff to discuss the Route 100 Vision Plan, to determine the areas planned for growth, and to identify sewer needs in those areas;
- Reviewed topographic, wetland (and other environmental features), and water distribution system mapping to develop the proposed sewer extension projects;
- Reviewed current and proposed zoning requirements to identify restrictions or new allowances on future development; and
- Reviewed the Town's sewer use ordinance to determine consistency with the Town's 2013 Comprehensive Plan and growth objectives

1.2.2 Assessment of Future Sewer Service Needs

The following is a list of tasks completed and documentation reviewed to assess the future sewer service needs for the Town. Possible future conditions are discussed in Section 3 and existing infrastructure needs and costs are discussed in Section 4.

- Reviewed the Town's 2013 Comprehensive Plan to help develop a sewer master plan that is compatible with the Town's plan for smart development;
- Held meetings with Town staff to discuss the Route 100 Vision Plan, to determine the areas planned for growth, and to identify sewer needs in those areas;
- Reviewed topographic, wetland (and other environmental features), and water distribution system mapping to developed the proposed sewer extension projects;
- Reviewed current and proposed zoning requirements to identify restrictions on future development; and
- Reviewed the Town's draft sewer use ordinance to determine consistency with the Town's 2013 Comprehensive Plan.

1.2.3 Development of Sewer Master Plan

The following is a list of tasks completed to develop the sewer master plan. Recommendations are discussed in Section 5 and financing options are discussed in Sections 6.

- Developed conceptual plans for extending sewers to serve areas of Town west of Route 295, identified in Section 3, that are not currently served by public sewer and are within the Growth Area;
- Estimated costs for each sewer extension plan;
- Generated flow estimates from existing and future sewer areas;
- Reviewed and selected methods to collect and pump wastewater;
- Assessed infrastructure improvements required to handle current and future flows;
- Prepared cost estimates for improvements to existing facilities required to accommodate future flows;

- Reviewed feasibility of sending some sewer flows to Portland or Westbrook;
- Prioritized infrastructure improvements based on likely need; and
- Proposed methods to finance future capital projects.

SECTION 2
EXISTING CONDITIONS

This section includes a discussion of the existing conditions of the sanitary sewer collection system and pumping facilities in West Falmouth; the wastewater treatment facility (WWTF); a discussion of the non-sewered area of the Town; and a summary of existing flows.

2.1 GRAVITY COLLECTION SYSTEM

The West Falmouth sewer systems consists of approximately 485 manholes, 17 pump stations, and over 25 miles of gravity sewer and force main. Sewer extended into West Falmouth in 1969 but most of the collection system was created in the late 1980s to 2000s. A map of the West Falmouth sewer system is shown in Figure 2-1.

The 2009 Pump Station Evaluation included modeling for multiple interceptors. This modeling was reviewed with respect to the future flow projections described in Section 3. The four interceptors modeled in West Falmouth are:

- Interceptor to Leighton Road Pump Station from the TD Bank building on Route 100;
- Interceptor from Pinehurst Drive Pump Station terminus manhole to Woodland Clubhouse Pump Station;
- Interceptor from Pleasant Hill Road to Middle Road Pump Station; and
- Interceptor from Woodland Clubhouse Pump Station terminus manhole, down Woods Road, to Longwoods Road, to Middle Road, to Lunt Road Pump Station.

The interceptors to Leighton Road and Pinehurst Drive pump stations were found to have sufficient capacity for reasonably expectable future flows. The interceptor to Middle Road Pump Station was found to be just over capacity at anticipated full build-out but will likely be sufficient. The interceptor to Lunt Road Pump Station from just upstream of the Falmouth Spur was found to currently surcharge during high flows and was expected to be well over capacity at future flows. Replacement of this Interceptor was recommended and is described further in Section 4.

Wastewater Treatment Facility
Sewer Pump Station
Sewer Manhole
Sewer Force Main
Sewer Gravity Main

Hazeltine Dr
Inverness Road
Leachfield
Birkdale Road
Baltusrol Cir
Hedgerow Dr
HEDGEROW DR
UNDERWOOD RD
Underwood Road
JOHNSON RD
Johnson Road
SHADY LN
Northbrook Drive
KNIGHT ST
Handy Boat
Middle Rd
HADLOCK RD
WINN RD
TERISON DR
FIELD RD
WOODVILLE RD
LONGWOODS RD
SHERMAN DR
INTERSTATE
FORESIDE RD
Mill Creek
Old Mill
WOODS RD
Clubhouse
Pinehurst Lane
Old Oak Way
BUCKNAM RD
DEPOT RD
Lunt Road
Tidewater
Thornhurst Road
Waite's Landing
WAITES LANDING RD
Landing Woods
CLEARWATER DR
ROUTE ONE
Clearwater Drive
EUREKA RD
GRAY RD
TWIN PONDS DR
High School
Woodlands Drive
Cherrywood Lane
Lindenwood Lane
Falmouth Road
Mill Road
HILLSIDE AVE
TURNPIKE
BENTRIDGE DR
MOUNTAIN RD
SUSAN LN
BLACKSTRAP RD
RED OAK DR
BROOK RD
Leighton Road
LEIGHTON RD
TURNPIKE SPUR
FALMOUTH RD
MERRILL RD
MIDDLE RD
Middle Road
Brown Street
ASTER LN
SURREY LN
ALLEN AVE EXT
PLEASANT HILL RD
HAMLIN RD
100
95
295
9
1

N
0 0.5 1
Miles

Town of Falmouth, Maine
Collection System

PROJ NO:	DATE:
13014A	June 2017

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FIGURE: 2-1

2.1.1 Non-sewered Areas

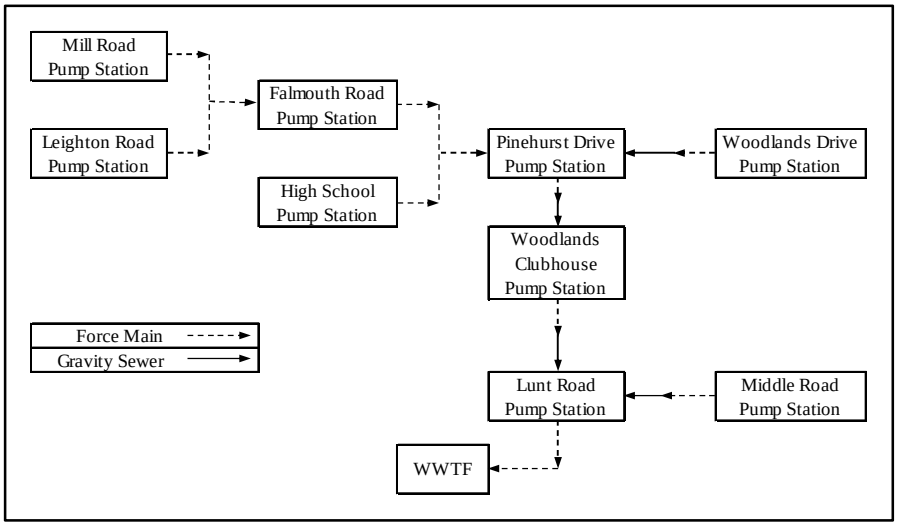
Figure 2-1 shows a significant portion of West Falmouth is not currently served by public sewer. Developed properties in these areas are primarily residential and are served by privately owned on-lot septic systems consisting of a septic tank and a subsurface disposal field. In areas not served by public sewer, the current and proposed zoning of Farm and Forest or Residential B2 and Residential B1 provide enough land area per home (minimum lot size 80,000-sf/lot, 40,000-sf/lot and 30,000-sf/lot respectively) to allow for installation of a septic tank and subsurface disposal field. For lots in these zones, on-lot septic systems can provide a cost-effective and acceptable means for wastewater treatment and disposal, especially for those areas served by public water and not dependent on a private on-lot well.

2.2 PUMPING STATIONS

The Town owns and operates 31 pump stations, 17 of which serve the West Falmouth area.

Figure 2-2 shows the schematic layout of the nine major pump stations that serve the West Falmouth Area. The eight smaller pump stations not shown on the figure are accounted for in the flows of the larger pump stations.

FIGURE 2-2
WEST FALMOUTH PUMP STATION SCHEMATIC



The figure shows that depending on where wastewater flow originates, it may have to be pumped through several pump stations to reach the treatment plant. As such, an increase in flow at Mill Road Pump Station or Leighton Road Pump Station would result in the potential need to increase the size of downstream pump stations.

2.2.1 Lunt Road Pump Station

Lunt Road Pump Station (Figure 2-3) is located off Lunt Road, adjacent to I-295. It was constructed in 1969 with a major upgrade in 2006. It is the largest station in West Falmouth and collects all flows from West Falmouth as well as a small section of East Falmouth and Farm Gate Road Pump Station. It includes a fiberglass shelter with two suction lift style pumps, discharge piping and valves, and pump controls. Electrical panels and an emergency generator are located near the pump shelter. Additional storage is provided by the original wet well.

The pumps have a capacity of 592 and 594 gallons per minute (gpm) based on draw down tests conducted in 2008. The pump capacity is very close to the nameplate capacity, of 600 gpm. The pumps operate in a lead/lag sequence.

FIGURE 2-3
LUNT ROAD PUMP STATION

The station has an 8-inch diameter HDPE force main which discharges directly to the WWTF. The total length of the force main is approximately 4,500 feet.

2.2.2 Middle Road Pump Station

Middle Road Pump Station (Figure 2-4) is located off Middle Road, beside the Presumpscot River. It was constructed in 1981. The station collects residential flows from Middle Road, south of Lunt Road, on both sides of the river, along with flows from Pleasant Hill Road and adjacent streets. It includes two submersible style pumps, discharge piping and valves, and exterior pump controls and electrical panels. New replacement pumps were recently purchased and will be installed at the next major maintenance interval.

The existing pumps have a capacity of 78 and 94 gpm based on draw down tests conducted in 2008. The replacement pumps, when installed, will boost the current capacity only slightly. The pumps operate in a lead/lag sequence.

FIGURE 2-4
MIDDLE ROAD PUMP STATION

The station has a 6-inch diameter ductile iron force main which discharges to the 8-inch diameter gravity interceptor on Middle Road that runs to Lunt Road Pump Station. The total length of the force main is approximately 4,400 feet.

2.2.3 Woodlands Clubhouse Pump Station

Woodlands Clubhouse Pump Station (Figure 2-5) is located beside the Woodlands Clubhouse parking lot off of Woodlands Drive. It was constructed in 1987. The station collects wastewater flows from homes east of the Clubhouse, the Clubhouse itself, and a short section of Woodlands Drive along with flows from Pinehurst Drive Pump Station. It includes two submersible style pumps, discharge piping and valves, pump controls, electrical panels, and an emergency generator. Two tanks provide 10,300 gallons of storage to handle peak flows and brief power outages.

The pumps have a capacity of 141 and 151 gpm based on draw down tests conducted in 2008. The pump capacity is much lower than nameplate capacity of 240 gpm, likely due to wear of the pumps and buildup within the force. The pumps operate in a lead/lag sequence. The pump capacity of the upstream Pinehurst Drive Pump Station is higher than Woodland Clubhouse Pump Capacity but, the additional storage allows for attenuation of peak flows.

FIGURE 2-5
WOODLAND CLUBHOUSE PUMP STATION

The station has a 6-inch diameter, PVC force main which discharges to the 8-inch diameter gravity interceptor on Spruce Lane that runs along Woods Road and Middle Road to the Lunt Road Pump Station. The total length of the force main is approximately 2,000 feet.

2.2.4 Pinehurst Drive Pump Station

Pinehurst Drive Pump Station (Figure 2-6) is located at the end of Pinehurst Lane. It was constructed in 1987. The station collects residential flows from Pinehurst Lane, Maplewood Circle and some sections of Woodlands Drive along with flows from Woodlands Drive Pump Station, High School Pump Station, and Falmouth Road Pump Station. It includes two submersible style pumps, discharge piping and valves, external mounted pump controls and electrical panels, and an emergency generator located beside the station. An additional storage tanks provide 2,400 gallons of storage to handle peak flows and brief power outages.

The pumps have a capacity of 154 and 150 gpm based on draw down tests conducted in 2008. The pump capacity is higher than the nameplate capacity of 125 gpm. The pumps operate in a lead/lag sequence. The pump capacities of the three upstream pump stations exceed the Pinehurst Drive Pump Station capacity but, the additional storage allows for attenuation of the peak flows. Further, the High School Pump Station and Falmouth Road Pump Station are not allowed to operate concurrently or they could overwhelm Pinehurst Drive Pump Station.

FIGURE 2-6
PINEHURST DRIVE PUMP STATION

The station has a 4 inch diameter PVC force main which discharges to the 8-inch diameter gravity interceptor on Woodlands Drive that runs to Woodlands Clubhouse Pump Station. The total length of the force main is approximately 1,465 feet.

2.2.5 Woodland Drive Pump Station

Woodlands Drive Pump Station (Figure 2-7) is located off Woodlands Drive near the intersection with Lindenwood Lane. It was constructed in 1987. The station collects residential flows from most of Woodlands Drive and two small pump stations on Lindenwood Lane and Cherrywood Lane. It includes two submersible pumps, discharge piping and valves, pump controls and electrical panels.

The pumps have a capacity of 153 and 117 gpm based on draw down tests conducted in 2008. The pump capacity is higher than the nameplate capacity of 110 gpm. The pumps operate in a lead/lag sequence.

FIGURE 2-7
WOODLANDS DRIVE PUMP STATION

The station has a 4 inch diameter PVC force main which discharges to the 8-inch diameter gravity interceptor on Woodlands Drive that runs to Pinehurst Pump Station. The total length of the force main is approximately 775 feet.

2.2.6 High School Pump Station

High School Pump Station (Figure 2-8) is located in the South East corner of the High School property off Woodville Road. It was constructed in 1989. The station collects institutional flows from the school and residential flows from Woodville Drive. It includes two submersible pumps, discharge piping and valves, pump controls, and electrical panels.

The pumps have a capacity of 229 and 218 gpm based on draw down tests conducted in 2008. The pump nameplate capacity is unknown. The pumps operate in a lead/lag sequence.

FIGURE 2-8
HIGH SCHOOL PUMP STATION

The station has a 6-inch diameter PVC force main which connects to the combined 6-inch force main with Falmouth Road Pump Station before entering the Pinehurst Drive Pump Statin wet well. The total length of the force main is approximately 2,900 feet. The combined section of force main is approximately 670 feet long.

2.2.7 Falmouth Road Pump Station

Falmouth Road Pump Station (Figure 2-9) is located off Falmouth Road less than half a mile east of the Town Hall on the right. It was constructed in 1998. The station collects residential flows from Ladyslipper Lane and a small section of Falmouth road as well as flow directly from Leighton Road Pump Station and Mill Road Pump Station. It includes two suction lift style pumps in a building that contains, discharge piping and valves, pump controls, and electrical panels. An emergency generator is located next to the building.

The pumps have a capacity of 220 and 159 gpm based on draw down tests conducted in 2008. Pump capacity is much lower than nameplate capacity of 250 gpm, likely due to wear of the pumps and buildup within the force main. The pumps operate in a lead/lag sequence. The pump capacity of Mill Road Pump Station and Leighton Road Pump Station are higher than Falmouth Road Pump Station pumping capacity (assuming the 159 gpm pump is operational). There is no additional storage at this station to attenuate the higher flows.

FIGURE 2-9
FALMOUTH ROAD PUMP STATION

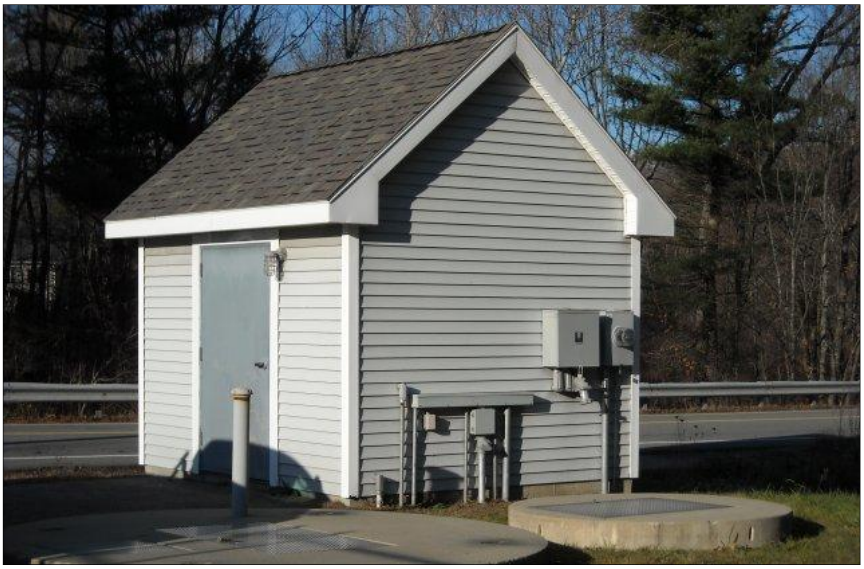
The station has a 6-inch diameter PVC force main which connects to the combined 6-inch force main with High School Pump Station before entering the Pinehurst Drive Pump Station wet well. The total length of the force main is approximately 5,500 feet. The combined section of the force main is approximately 670 feet.

2.2.8 Leighton Road Pump Station

Leighton Road Pump Station (Figure 2-10) is located off Leighton Road near the Piscataqua River. It was constructed in 1998. The station collects residential and commercial flows from the south portion of Route 100 (Gray Road) and parts of Leighton Road. It includes a building that contains two suction lift style pumps, discharge piping and valves, pump controls and electrical panels. An emergency generator is located next to the pump building.

The pumps have a capacity of 196 and 208 gpm based on draw down tests conducted in 2008. The pump capacity is much lower than nameplate capacity of 270 gpm, likely due to wear of the pumps and buildup within the force main. The pumps operate in a lead/lag sequence. Currently, pump controls at Leighton Road Pump Station and Mill Road Pump Station prevent both stations from pumping at the same time to reduce peak flows to Falmouth Road Pump Station.

FIGURE 2-10
LEIGHTON ROAD PUMP STATION



The station has a 6-inch diameter PVC force main which connects with the Mill Road force main to a combined 8-inch ductile iron force main before entering the Falmouth Road Pump Station wet well. The total length of the force main is approximately 3,200 feet. The combined section of force main is approximately 1,460 feet.

2.2.9 Mill Road Pump Station

Mill Road Pump Station (Figure 2-11) is located off Mill Road between the intersection with Gray Road and the Piscataqua River. It was constructed in 2002. The station collects residential and commercial flows from the west portion Falmouth Road, Mill Road and Winn Road including the flows from Falmouth on the Green. It includes two submersible pumps, discharge piping and valves, externally mounted pump controls, electrical panels and an emergency generator beside the Pump Station.

The pumps have a capacity of 204 and 196 gpm based on draw down tests conducted in 2008. The pump capacity is very similar to the nameplate capacity of 200 gpm. The pumps operate in a lead/lag sequence. Currently, pump controls at Leighton Road Pump Station and Mill Road Pump Station prevent both stations from pumping at the same time to reduce peak flows to Falmouth Road Pump Station.

FIGURE 2-11
MILL ROAD PUMP STATION

The station has a 6-inch diameter PVC force main which connects with the Leighton Road force main to a combined 8-inch ductile iron force main before entering the Falmouth Road Pump Station wet well. The total length of the force main is approximately 6,100 linear feet. The combined section of the force main is approximately 1,460 feet.

2.2.10 Other Pump Stations

There are eight other minor pump stations in West Falmouth that are operated by the Town. Five are on the properties of Falmouth on the Green: Hazeltine, Inverness, Birkdale, Leachfield, and Baltusrol pump stations. The three other pump stations are near the Woodland Clubhouse Golf Course: Lindenwood Lane, Cherrywood Lane, and Old Oak Way pump stations. The area served by each of these eight pump stations is both out of the Growth Area and, near or at full development potential based on current zoning requirements. Pump station capacity was assumed to stay the same as current as part of this plan

Average flows for these pump stations were accounted for in the run time data of the larger downstream pump stations to which they discharge. Peak flow from these pump stations was based on peak pumping rate and was also accounted for in the downstream flows.

2.3 WASTEWATER TREATMENT FACILITY

The Town is served by a 1.56 million gallon per day (mgd) activated sludge WWTF located off Clearwater Drive with the final treated effluent discharged to the tidal portion of the Presumpscot River. The facility has been in operation since 1971. The Town of Cumberland connected in 1981 and was allocated 30% of the licensed average daily flow or 0.468 mgd. The facility includes: influent flow measurement, screening, grit removal, aeration basins, secondary clarifiers, sodium hypochlorite disinfection, sodium bisulfite dechlorination, sludge digester and solids dewatering systems. Many of the unit processes have been upgraded since 1971, but some of the facilities are original to 1971. A major facility upgrade occurred in 2006 which included:

- new aeration basins and blowers,
- new chlorine contact tank and disinfection building,
- new electrical building,
- new scum pump station and septage receiving station,
- new mechanical screens,
- new clarifier mechanism,
- new sludge pumps,
- renovation of the control building,

- renovation of the sludge holding tanks, and
- replacement of other pipes, pumps, controls and equipment.

2.4 CURRENT FLOWS

The following is a brief discussion on the current flows for the WWTF and for each pump station. In addition, the organics and solids loadings are summarized for the WWTF.

2.4.1 Wastewater Treatment Facility

A summary of wastewater flows and loads to the Town of Falmouth's WWTF for the period of January 1, 2010 to December 3, 2012 are summarized in Table 2-1. It should be noted that the WWTF can experience peak hourly flows of approximately 4.9 mgd. A hydraulic model of the wastewater treatment facility has determined that the plant can "pass" a maximum flow of 5.2 mgd.

TABLE 2-1: WWTF CURRENT FLOWS AND LOADS (JANUARY 1, 2010-DECEMBER 3, 2012)

	Average	Maximum Month	Peak Day
Flow (mgd)	0.95	1.66	4.25
BOD_5 (lbs./day)	1,770	2,150	3,309
TSS (lbs./day)	1,958	2,936	4,854

2.4.2 Pump Stations

2.4.2.1 Average Daily Flow

Current average daily flow was determined for each pump station by multiplying the average daily run time for each pump by each pump's capacity. This approach assumes that each pump runs at full capacity for the duration of the run time. Pump station flow rate was determined by draw down tests conducted in 2008 as part of the 2009 Comprehensive Pump Station

Assessment. Pump run time data was used for an 18 month period from April 2013 to October 2014.

The value for average daily flow was based on the average daily run time for both pumps for this study period. This value may be slightly higher than the actual average daily flow for some pump stations that have days were both pump operate simultaneously but this difference does not have a notable effect on the values. Modifications were made for Lunt Road Pump Station which typically runs at a maximum flow of 470 gpm instead of the pump capacity of 592 gpm. Table 2-2, at the end of this section, summarizes average daily flow for the nine pump stations in West Falmouth.

Flows for eight of the smaller pump stations in West Falmouth were not assessed, since flows to these stations are not expected to increase. Flow from the eight smaller pump stations is included in the pump stations downstream.

2.4.2.2 Peak Day Flow

Current max day flow rate was determined for each pump station by multiplying the highest combined day run time for both pumps by each pump's capacity. This approach assumes that each pump runs at full capacity for the duration of the run time. This value is likely higher than the actual peak day flow for some stations because run times occasionally total more than 24 hours and the combined flow rate from both pumps running will be less than the sum of their pumping rates. Peak day flow for Lunt Road Pump Station which typically runs at 470 gpm was calculated based on the full pump capacity of 592 gpm. Table 2-2, at the end of this section, summarizes peak day flow for the nine pump stations in West Falmouth that were analyzed as part of this report.

2.4.2.3 Peak Instantaneous Flow

For some stations, current peak instantaneous flow from each pump station is based on the maximum pump capacity. For others, it is equal to the peak day flow. This value may be less than the actual peak flow into the station but, there is no way to reliably predict peak flow to

each station without the use of flow monitoring equipment. Table 2-2, at the end of this section summarizes peak instantaneous flow from the nine pump stations in West Falmouth.

TABLE 2-2:
SUMMARY OF FLOWS FROM WEST FALMOUTH PUMP STATIONS
(APRIL 2013 TO OCTOBER 2014)

Pump Station	Average Day Flow		Peak Day Flow		Peak Instantaneous Flow	
	gpd	gpm	gpd	gpm	gpd	gpm
Lunt Road	233,000	162	903,000	627	903,000[1]	627[1]
Middle Road	53,000	37	179,000	124	179,000[1]	124[1]
Woodland Clubhouse	71,000	49	212,000	147	212,000[1]	147[1]
Pinehurst Drive	63,000	44	253,000	176	253,000[1]	176[1]
Woodland Drive	9,000	6	36,000	25	168,000[2]	117[2]
High School	6,000	4	29,000	20	314,000[2]	218[2]
Falmouth Road	56,000	39	228,000	158	229,000[2]	159[2]
Leighton Road	12,000	8	24,000	17	282,000[2]	196[2]
Mill Road	24,000	17	88,000	61	282,000[2]	196[2]

Note: (1) Peak instantaneous flow is assumed as the peak day flow.
(2) Peak instantaneous flow is assumed as the lower of two pumps pumping capacity

SECTION 3
POSSIBLE FUTURE CONDITIONS

This section includes a description of the planning area, technologies considered for future sewer extension projects, the planning period, and population and growth projections. This section also includes a description of the proposed sewer extension projects including projected future flows and estimated construction costs.

3.1 PLANNING AREA

The Town of Falmouth recently developed a comprehensive plan which outlines a target Growth Area described further in the following section. Although the entire area west of I-295 was taken into consideration at the beginning of the study, the scope was quickly directed to future sewer extension and planning within the Growth Area defined by the 2013 Comprehensive Plan. Focusing the sewer master plan within the Growth Area helps align the sewer master plan with the Town's vision for smart growth.

3.1.1 Growth Area

The target Growth Area was outlined in the 2013 Comprehensive Plan. A map of the Growth Area in West Falmouth is included in Figure 3-1. The Growth Area covers two separate sections of West Falmouth. The first section includes:

1) North of Portland and south of the Presumpscot River along Middle Road, Ledgewood Road, Allen Avenue Extension, and Pleasant Hill Road (Appendix A, Map 1);
2) North of the Presumpscot River and south of the Falmouth Spur along Middle Road, Merrill Road, and parts of Falmouth Road up to the Merrill Road intersection (Appendix A, Map 2); and
3) Between the Falmouth Spur and Cumberland along Middle Road, Ledgewood Road to just past the Sherman Drive intersection, and along Woods up to Marshall Drive (Appendix A, Map 3).

The second section includes:

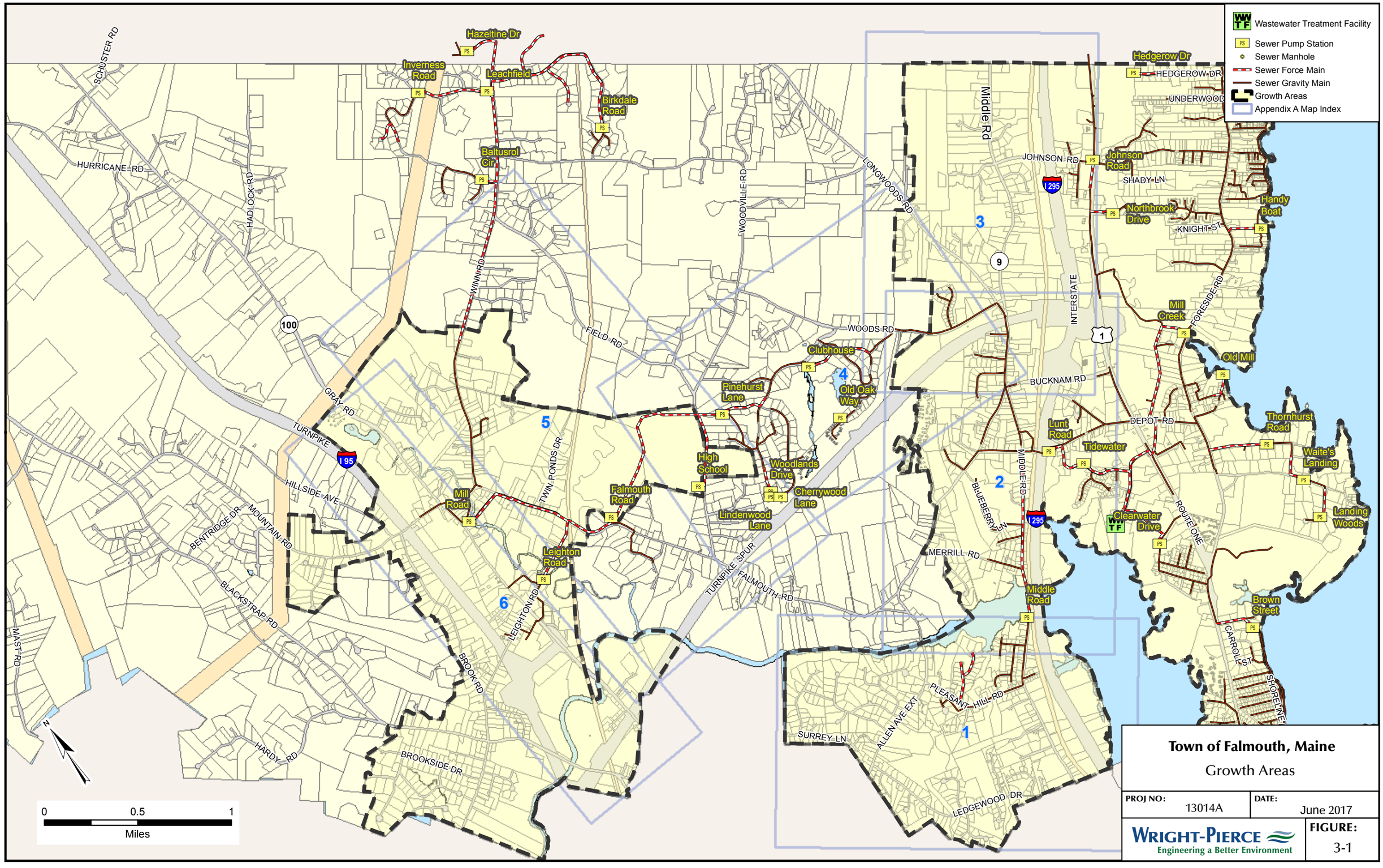
1) The High School property and land served by the High School Pump Station (Appendix A, Map 5);
2) East of the High School to Route 100 along Twin Ponds Drive, sections of Falmouth Road west of the railroad crossing, and along Winn Road to just south of the intersection with Paddock Way (Appendix A, Map 5);
3) Route 100 from the Portland Town line to the Central Maine power easement (Appendix A, Map 6); and
4) West of I-95 along Mountain Road up to the Central Maine Power easement, along Brook Road from Mountain Road to the Portland Town line, along Blackstrap Road up to the intersection with Blackstrap Way, and in the Brookside Drive and Indian Way development (Appendix A, portions included in Map 6).

Map 4 in Appendix A covers the area between Woods Road and the High School (including the Woodlands) which is not designated in the Growth Area.

3.1.2 Excluded Areas within Growth Area

There are a number of unsewered areas inside the Growth Area with fairly large lot sizes that could easily support onsite septic systems and have topography that would require multiple pump stations to convey flow to the existing collection system. Many of these areas are already partially or mostly developed and currently relying on onsite septic systems for wastewater treatment and disposal. In consultation with Town Staff, the following areas have been eliminated from the study as onsite septic systems will be more cost effective than extending Town sewer:

- West of Allen Avenue Extension (Stapleford Neighborhood – Appendix A, Map 1)
- South of the Presumpscot River bridge on Route 100 (Appendix A, Map 5)
- North of the Piscataqua River bridge on Route 100 (Appendix A, Map 5)
- West of I-95 (Appendix A, Map 5)



Town of Falmouth, Maine

Growth Areas

PROJ NO:	DATE:
13014A	June 2017

WRIGHT-PIERCE
Engineering a Better Environment

FIGURE: 3-1

3.2 WASTEWATER COLLECTION, PUMPING, AND TREATMENT TECHNOLOGIES CONSIDERED

The Town currently has a combination of conventional gravity sewers, pumping stations, and some small sections of low pressure sewer to collect and convey wastewater to the WWTF. These same methods were considered for future expansion of the sewer system and are described further below along with some alternative methods including decentralized treatment and pumping flows to other towns.

3.2.1 Gravity Sewer and Pump Station

The Town of Falmouth operates 41 miles of gravity sewer, 25 miles of which are in West Falmouth. The Town operates 31 pump stations, 17 pump stations are located in West Falmouth. When appropriate grade is available gravity sewers are selected as the preferred option for sewer collection systems. These gravity sewer sections flow to pump stations which pump to other sections of gravity sewer. The Town owns the trunk sewer in the public right of way (gravity sewer main line, and manholes). Each property owner owns the lateral from public sewer line to their home and is responsible for maintenance of that section. Insomuch as possible for potential sewer extensions, new gravity systems, pump stations, and force mains are shown within existing Town roads, with some exceptions.

3.2.2 Low Pressure Sewer

Low pressure sewer systems use small pump stations at each property to move wastewater through a common force main typically located in the right of way. The Town operates two low pressure sewer systems in West Falmouth, one on Cleavers Farm Road and Maple Street and one on Falmouth Road. There are also a number of private low pressure sewer systems that discharge into the Town's system. This option was considered for areas with fluctuating topography that would require multiple pump stations to serve a small area. The Town owns the trunk sewer in the public right of way (force main). Each property owner owns and is responsible for

maintenance of the individual lateral connecting the property to public sewer and the small pump grinder station located on their property.

3.2.3 Pumping Flow to Portland or Westbrook

The option of pumping flows to Portland or Westbrook was evaluated. No financial incentive could be identified when considering the infrastructure needed to transport the wastewater to the Town line, upgrade the respective community's system to accept the new flow and “buy-in” to the associated city’s sewer system infrastructure. The lack of financial incentive combined with the effort and uncertainty associated with developing an intermunicipal agreement let to a decision by Town Staff to not pursue this option further.

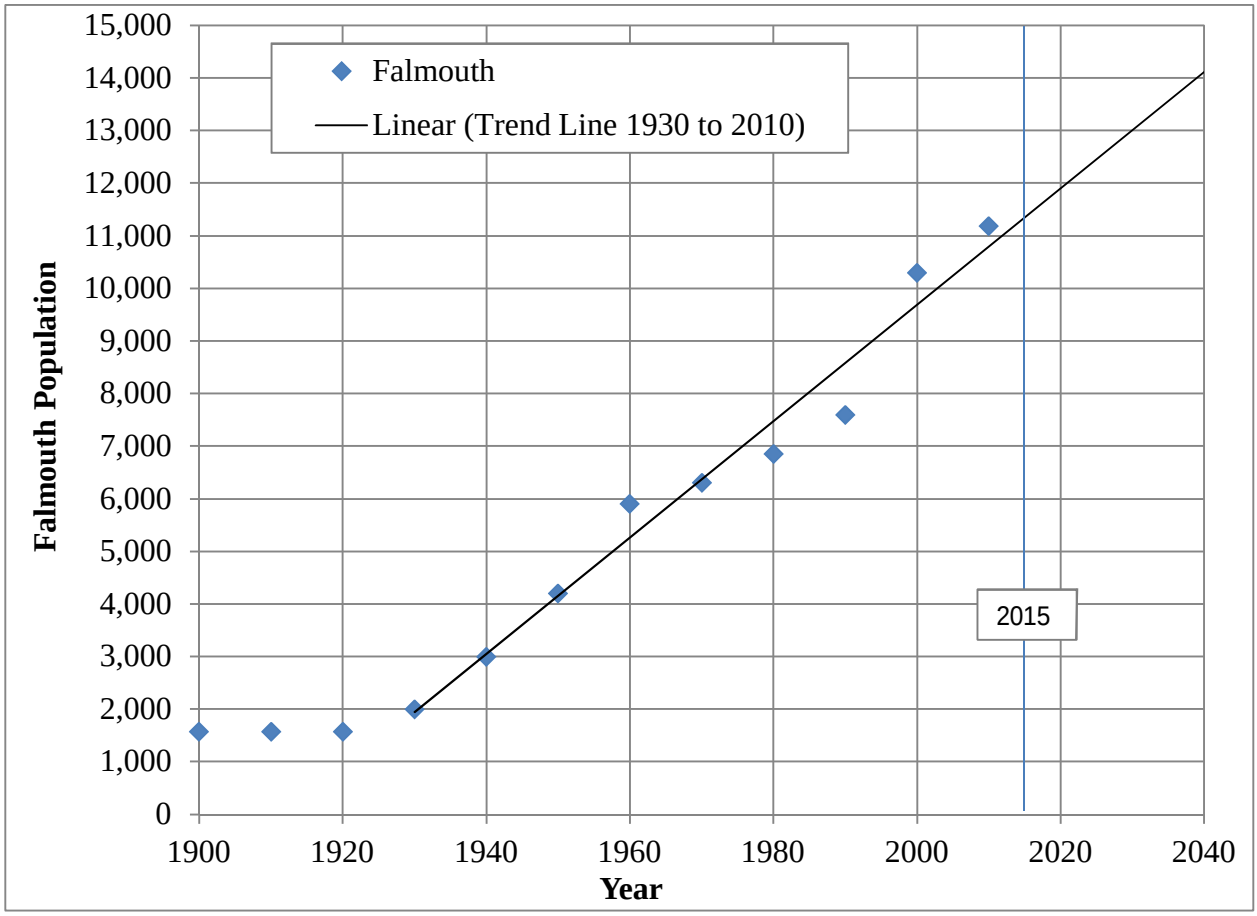
3.2.4 Decentralized Treatment

The alternative of decentralized wastewater treatment facilities was discussed early on in the planning process for the more remote areas in Town however, the proximity of these areas to the existing collection system within the Growth Area and the difficulty of licensing a new outfall made this option impractical and cost prohibitive.

3.3 POPULATION AND GROWTH PROJECTIONS

Figure 3-2 below displays the US census population data for Falmouth from 1900 to 2010. Based on the 2010 census figures Falmouth had a population of 11,185 (sewered and unsewered and, West Falmouth and East Falmouth). Since about 1930 growth Town wide has been steady at about 110 people per year.

FIGURE 3-2
FALMOUTH POPULATION



Eventually a town's population growth rate will slow and reach a maximum build-out population based on the land available for development and the land use zoning regulations that dictate housing density. If zoning regulations change, the total population growth rate could increase or decrease.

The rate of decreased growth as the population reaches build-out is difficult to predict. This study reviews the sewer capacity necessary for build-out of the West Falmouth sewer system based on the current Growth Area and proposed zoning within that Growth Area. The time to reach full build-out in West Falmouth will be greatly affected by the regional economy in the coming years.

3.4 PLANNING PERIOD

Flow estimates were based on total build-out allowed by the proposed zoning within the Growth Area. The time to reach this build-out may be beyond 50 years and will be dependent on the Town's zoning ordinance, growth of the local economy, and pressure by local developers.

Pipe sizing is based on complete build-out of the Growth Area based on the proposed zoning changes. The typical planning period for buried pipe is 50 years. The incremental cost of installing larger pipe for higher flows is small compared to the cost of replacing a pipe.

Options for phased upgrades are proposed where incremental improvements could be made cost efficiently.

3.5 FUTURE FLOW PROJECTIONS

The following is a brief summary of the process used to determine the future flow projections for this Plan as well as a description of assumptions.

3.5.1 Residential Average Daily Flow Projection Method

3.5.1.1 Minimum Lot Size Multiplier

The Long Range Planning Advisory Committee (LPAC) draft report utilized a minimum lot size multiplier to eliminate lots that are unlikely to be subdivided despite adequate land area. The flow estimate for residential homes utilized this minimum lots size multiplier to maintain consistency with the Comprehensive Plan. If a property is not at least three times the minimum lot size it was assumed the lot would not be subdivided because, the chances of this size lot being subdivided is low unless, the original home was placed with the intent of subdividing.

3.5.1.2 Buildable Land

If a lot is large enough to be subdivided than it was estimated that 80% of the lot is suitable for building. The other 20% of each lot is set aside for roads and utilities, or is not expected to be buildable due to water features, slope, or unsuitable soils. Reductions in the base buildable land were made on lots with notable wetlands or significant slopes.

In select areas, the buildable land was reduced to 50% due to a low likelihood that development would occur due to distance from the sewer system, difficulty of the terrain, etc. These areas are along Middle Road north of the Falmouth Spur and the area south of the Presumpscot River from Middle Road to Allen Avenue Extension.

A sensitivity analysis was conducted with 50% available buildable land for the entire study area which resulted in a small decrease in future flows. The results of the sensitivity analysis are discussed in Section 3.7.

3.5.1.3 Zoning

Changes to current zoning related to lot size were based on input from the LPAC draft report "*Comprehensive Plan Implementation Growth Area Recommendations – Year 1"*. The new zoning is designed to help promote development in accordance with the Comprehensive Plan. Table 3-1 shows the proposed minimum lot sizes which were used to determine how many homes could fit on each lot. Zoning and minimum lot sizes still need to be approved by the Town Council. Adjustments to these minimum lot sizes or zone boundaries would change future flow estimates.

TABLE 3-1
PROPOSED ZONES AND MINIMUM LOT SIZE

Zone	Zone Abbreviation	Minimum Lot Size
Mixed Use Commercial/ Village Mixed Use[1]	MUC/VMU	10,000 sf/lot
Residential B1	RB1	30,000 sf/lot
Residential B2	RB2	40,000 sf/lot
Farm and Forest	F	80,000 sf/lot

Note: 1) Most lots in Zone MUC/VMU are in Commercial Use. Refer to Section 3.5.2 for flow estimates of commercial properties.

3.5.1.4 Number of New Homes

The buildable land percentage, zoning, minimum lot size, and lot size multiplier were all used to develop the total number of new homes that could be developed in West Falmouth. Table 3-2 shows the number of homes per lot for 4 sample properties with different zoning.

TABLE 3-2
EXAMPLES OF LOT DEVELOPMENT POTENTIAL

	Example 1	Example 2	Example 3	Example 4
Existing Lot Size	78,000 sf	92,000 sf	520,000 sf	150,000 sf
Zone	RB1	RB1	F	MUC/VMU
Zoning Minimum Lot Size	30,000 sf /Lot	30,000 sf /Lot	80,000 sf /Lot	10,000 sf /Lot
Is Minimum Lot Size Multiplier Satisfied?	No	Yes	Yes	Yes
Buildable Land (80% of original)	62,400 sf	73,600 sf	416,000 sf	120,000 sf
Number of Total Residential Lots	1	2	5	12

3.5.1.5 Flow per Home

Each home was estimated to produce 156 gallons of wastewater per day. This value is based on an average water use of 60 gallons per day per person and an average of 2.6 people per home. These values were used in the WWTF study of 2002, *"Wastewater Facilities Study Update of the Richard B. Goodenow Water Pollution Control Facility Town of Falmouth, Maine."* A cursory review of water use data for residential Falmouth users from 2007 showed that these values were still valid.

3.5.1.6 Additional Dwelling Units

The LPAC draft report identified the potential of Additional Dwelling Units (ADU) on each property. An ADU is an additional living quarter on single-family lots that are independent of the primary dwelling unit. The LPAC report indicated that while each residential lot has the potential of adding an ADU, the current number of ADUs in Falmouth is relatively small. As such, the flow estimates do not include flow from new ADUs. It is expected that any flow from new ADUs will be accounted for by the estimated number of new lots that could be developed with single family homes that stay undeveloped, or developed below full build-out potential.

3.5.2 Commercial Average Daily Flow Projection Methods

Within the study area, the majority of commercial lots are located along Route 100 from the Presumpscot River to the intersection of Mountain Road. GIS information for existing lot sizes and potential building footprint was utilized to determine potential flow from each lot. A description of factors used to determine future flow for commercial properties is described in the sections below.

3.5.2.1 Flow per Building Area

Commercial flows are typically estimated base on square feet of building area. Commercial development can range widely in sewer use per square foot from a grocery store with very little water use to a restaurant with a much higher flow per square foot. Typical values range from 0.03 to 0.06 gallons per day per square foot. A value of 0.06 gallons per day per square foot

(gpd/sf) was selected based on the existing and potential commercial development in the Route 100 Area. The existing building footprint was multiplied by this value to estimate the current flow from each building.

3.5.2.2 Percent Lot Coverage

The commercial flow estimate assumes buildings will cover 20% of the lot. This value is based on the existing development and potential development within the Route 100 area. Proposed lot coverage is higher than the existing development and accounts for infill development.

A sensitivity analysis was conducted using 12.5% lot coverage (same percent decrease as the residential sensitivity analysis) which resulted in a small overall decrease in future flows. The results of the sensitivity analysis are discussed in Section 3.7.

3.5.2.3 Flow per Land Area

The flow per building area was multiplied by the percent lot coverage to get the flow potential from each lot as shown in Table 3-3.

TABLE 3-3
COMMERCIAL FLOW ESTIMATE PER ACRE

Formula	Values
(Flow per Building Area, sf)	(0.06 gpd/sf)
× (convert square feet to acres)	× (43,560 sf/acre)
× (Percent Lot Coverage)	× (20% lot coverage)
= (Flow per Land Area)	= 523 gallons per day per acre

This value was used to determine the total potential flow from each lot. On lots already partially developed, the estimated existing building flow was subtracted from the total potential flow for each lot to get the estimated future additional flow from each lot.

The estimated future flow per acre is higher than current flow per acre along Route 100. However, this higher estimate was used to account for the addition of any heavy users (such as a brew-pub) which could result in a flow per acre higher than 523 gallons per day per acre.

3.5.3 Infiltration Allowances

Infiltration is groundwater that enters the sewer system through defects in the pipes, manholes, or pipe joints. Infiltration in existing sewers is already included in the existing flows. An allowance for infiltration in developed areas to be served by future gravity sewers of 500 gpd per inch-diameter-mile of sewer within the right of way is assumed. The total infiltration for sewer within the right of way was estimated at approximately 16,000 gallons per day. Note that when estimating peak flow rates, the peaking factor is only applied to sanitary flows and not the infiltration allowance.

3.5.4 Peaking Factors

Peaking factors are necessary in sizing wastewater infrastructure to account for diurnal and seasonal variation in wastewater flow that differs from the average. These factors are multiplied by average daily flow and infiltration is added to arrive at peak hourly flows. Factors such as the type of development, average daily flow, and proximity of the development to a collection point, such as a pump station, are considered. Based on these factors, normal peaking factor estimates could range from 3 to 6 depending on service area size. In our experience, these peaking factors can be very conservative. In addition, the average daily flows used in the flow projections which are noted above are already conservative. Using overly conservative peaking factors on top of the conservative average daily flow can result in unrealistic peak flow projections which could then result in oversized facilities.

Currently peak hourly flow data to the pump stations in West Falmouth are not available. The average day to peak day peaking factors are shown in Table 3-4 along with the proposed instantaneous peaking factor for future flows.

TABLE 3-4
PUMP STATION EXISTING PEAK DAY FACTOR AND FUTURE PEAK FACTOR FOR GRAVITY FLOWS

Pump Station	Existing Peak Day Peaking Factor	Future Peaking Factor
Mill Road Pump Station	3.65	3.5
Leighton Road Pump Station	2.19	3.0
Falmouth Road Pump Station	4.01	5.0
High School Pump Station	4.61	6.0
Woodland Drive Pump Station	4.40	N/A
Pinehurst Pump Station	4.04	N/A
Woodland Club Pump Station	3.00	N/A
Middle Pump Station	3.35	4
Lunt Station	3.88	3.5

N/A: No additional future flows are anticipated.
Existing peak day peaking factors include infiltration

The following equation was applied to calculate peak hourly flow (PHF) from average daily flow (ADF):

$$PHF = (ADF \times PF) + \text{Infiltration Allowance}$$

3.6 SEWER EXTENSION PROJECTS

Potential sewer extension projects and estimated costs are outlined in the following sections. These projects each serve a different part of the Growth Area in West Falmouth. Discussed further in Section 5, it is assumed that sewer extensions would be privately funded. The proposed projects have been developed to assist the Town in requiring sewer extensions that are beneficial to multiple users. It is recommended, that as parcels are developed, the Town should encourage sewer and force mains be built in the right-of-way to provide use for multiple users and to facilitate maintenance.

3.6.1 Cost Estimating

The costs for each project area are "all-in" costs including construction costs and 42% for contingency, technical services, and other costs. Total estimated unit costs are:

- Gravity Sewer - $240 per foot which includes: main line pipe, manholes, services to property line, and trench patch;
- Low Pressure Sewer - $170 per foot which includes: main line pipe, services to property line, and trench patch. Low pressure sewer costs do not include pumps for each property which is typically covered by the property owner;
- Force Main - $150 per foot which includes: main line pipe, air release and drain manholes, and trench patch; and $100 per foot when laid in the same trench as new proposed sewer; and
- Pump Stations - $700,000 each for a larger submersible pump station with an emergency generator and $350,000 for a smaller submersible pump station without a generator. Costs for pump stations could vary widely based on depth of wet well, style, size, and soil conditions.

3.6.2 Project Areas

3.6.2.1 Project Area 6-1: Route 100 (Area 1)

Project Area 6-1 would provide sewer service to Route 100 from the Leighton Road intersection north to the high point near the credit union. The project would consist of 1,050 feet of gravity sewer. The estimated cost is $252,000. This project can be seen on Map 6 of Appendix A.

3.6.2.2 Project Area 6-2: Route 100 (Area 2)

Project Area 6-2 would provide sewer service to Route 100 from the intersection of Mill Road south to the high point near the credit union. The project would consist of 1,800 feet of gravity sewer, one small pump station, and 1,100 feet of force main to the existing gravity sewer that flows to Leighton Road Pump Station. The estimated cost is $890,000. Approximately $120,000 could be saved if Project 6-1 was previously constructed. This project can be seen on Map 6 of Appendix A.

Sending flows to Mill Road Pump Station would reduce the force main length and cost but may overload Mill Road Pump Station once development occurs. Additionally, the new pump station should be minimally sized by selecting smaller pumps and including a larger ten foot diameter wet well with additional depth for storage to handle peak flows. Limiting the size of the new pump station would reduce peak flows to Leighton Road Pump Station and avoid the need to upgrade this station.

3.6.2.3 Project Area 6-3: Route 100 (Area 3, Portland North)

Project Area 6-3 would provide sewer service to the area of Portland North. The project would consist of one small pump station, and 1,600 feet of force main. The estimated cost is $590,000. Additionally, gravity sewer on the property would be necessary to get flow to the pump station but estimates of cost have not been proposed as the extent of the gravity sewer depends upon where development occurs. This project can be seen on Map 6 of Appendix A.

3.6.2.4 Project Area 6-4: Marston Street

Project Area 6-4 would provide sewer service to Marston Street and Oriole Street. The project would require 1,450 feet of gravity sewer, 1,150 feet if Project Area 6-1 was already constructed. The estimated cost is $348,000, $276,000 with project 6-1 already constructed. This project can be seen on Map 6 of Appendix A.

3.6.2.5 Project Area 6-5: Route 100 (Area 4)

Project Area 6-5 would provide sewer service to Route 100, north of the Falmouth Road intersection to the Piscataqua River Bridge. The project would consist of 1,700 feet of gravity sewer, one small pump station and 800 feet of force main. The estimated cost is $843,000. This project can be seen on Map 6 of Appendix A.

3.6.2.6 Project Area 5-1: Alpine Drive

Project Area 5-1 would provide sewer service to Alpine Drive and Sylvan Drive. The project would consist of 1,450 feet of gravity sewer, one small pump station, and 300 feet of force main. The estimated cost is $743,000. This project can be seen on Map 5 of Appendix A.

3.6.2.7 Project Area 5-2: Eureka Road

Project Area 5-2 would provide sewer service to Eureka Road and Greta Way. The project would consist of 1,200 feet of gravity sewer, one small pump station, 1,600 feet of force main, and 800 feet of low pressure sewer. The estimated cost is $940,000. This project can be seen on Map 5 of Appendix A.

3.6.2.8 Project Area 5-3: Twin Ponds Road

Project Area 5-3 would provide sewer service to Twin Ponds Road. The project would consist of 2,200 feet of low pressure sewer. The estimated cost of work within the right of ways is $374,000. This project can be seen on Map 5 of Appendix A.

3.6.2.9 Project Area 5-4: Leighton Road

Project Area 5-4 would provide sewer service to Leighton Road from the intersection of Falmouth Road South to the Piscataqua River Bridge near Leighton Road Pump Station. The project would consist of 1,600 feet of gravity sewer. The estimated cost is $384,000. This project can be seen on Map 5 of Appendix A.

3.6.2.10 Project Area 5-5: Falmouth Road

Project Area 5-5 would provide sewer service to Falmouth Road up to the intersection with Woodville Road. While outside of the Growth Area this section could be easily sewered by gravity. The project would consist of 1,900 feet of gravity sewer. The estimated cost is $456,000. This project can be seen on Map 5 of Appendix A.

3.6.2.11 Project Area 3-1: Longwoods Road

Project Area 3-1 would provide sewer service to Longwoods Road, from the Woods Road intersection to the edge of the Growth Area, Sherman Drive, MacKenzie Lane, and Periwinkle Way. The project would consist of 5,200 feet of gravity sewer, two small pump stations, 1,700 feet of force main, and 1,000 feet of low pressure sewer. The estimated cost is $2,288,000. This project can be seen on Map 3 of Appendix A.

3.6.2.12 Project Area 3-2: Middle Road (North)

Project Area 3-2 would provide sewer service to Middle Road from the Woods Road intersection North to the Cumberland line, as well as, all Roads off of this section of Middle Road. The project would consist of 12,000 feet of low pressure sewer. The estimated cost is $2,040,000. This project can be seen on Map 3 of Appendix A.

3.6.2.13 Project Area 2-1: Falmouth Road

Project Area 2-1 would provide sewer service to Falmouth Road from the intersection of Falmouth Ridges Drive to the intersection of Merrill Road. The project would consist of 2,100 feet of gravity sewer, one small pump station, and 1,600 feet of force main. The estimated cost is $1,027,000. This project can be seen on Map 2 of Appendix A.

3.6.2.14 Project Area 2-2: Merrill Road

Project Area 2-2 would provide sewer service to the section of Merrill road currently not served by sewer as well as service to Veronica Lane. The project would consist of 2,500 feet of gravity sewer and 550 feet of low pressure sewer. The estimated cost is $694,000. This project can be seen on Map 2 of Appendix A.

3.6.2.15 Project Area 1-1: Middle Road (South)

Project Area 1-1 would provide sewer service to a short section of Middle Road south of the intersection with Pleasant Hill Road. The project would consist of 600 feet of gravity sewer. The estimated cost is $144,000. This project can be seen on Map 1 of Appendix A.

3.6.2.16 Project Area 1-2: Thistle Lane

Project Area 1-2 would provide sewer service to Thistle Lane. The project would consist of 600 feet of gravity sewer. The estimated cost is $144,000. This project can be seen on Map 1 of Appendix A.

3.6.2.17 Project Area 1-3: Pleasant Hill Road

Project Area 1-3 would provide sewer service to a short section of Pleasant Hill Road between Knight Hill Road and Cleaves Farm Road. The project would consist of 500 feet of gravity sewer. The estimated cost is $120,000. This project can be seen on Map 1 of Appendix A.

3.6.2.18 Project Area 1-4: South of Presumpscot River

Project Area 1-4 would provide sewer service to the remainder of the area south of the Presumpscot River, North of Portland, and between Middle Road and Allen Avenue Extension. This project would consist of 18,700 feet of low pressure sewer. The estimated cost is $3,179,000. This project would cover the remainder of roads on Map 1 of Appendix A but, is not shown to improve map clarity.

3.7 SENSITIVITY ANALYSIS

A sensitivity analysis was conducted to determine the extent to which variations in the percent of buildable land (residential flow estimate) and lot coverage (commercial flow estimate) affected the estimated future flow to the sewer system. The future average daily flow estimate for

residential and commercial properties is explained in more detail in Section 3.5. Table 3-5 shows a comparison of the original flow estimate and the sensitivity analysis.

TABLE 3-5
FLOW ESTIMATE SENSITIVITY ANALYSIS

Input and Output	Original Flow Estimate	Sensitivity Analysis
Inputs		
Base Residential Buildable Land	80%	50%
Base Commercial Percent Lot Coverage	20%	12.5%
Output – Projected New Flow (Future Flows Only, No Existing Flow)		
Total Without Infiltration (gpd)	321,600	246,400
Commercial Flow Portion (gpd)	43,900	31,300
Residential Flow Portion (gpd)	277,800	215,000
Outputs – Future Total Lunt Road Pump Station (Future and Existing Flows)		
Total Future Average Daily Flow (gpm)	400	350
Total Future Peak Hourly (gpm)	1,480	1,420

The 37.5% reduction in developable area reduces the flow estimate for new flow a total of 12.5%. One reason for the lower impact of the sensitivity analysis is that some areas of the map already have reduced buildable land area (50%) due to the reduced likelihood of development. These areas were not reduced further during the sensitivity analysis. Areas with reduced buildable area are:

- Map 1 - South of Presumpscot River, North of Portland between Middle Road and Allen Avenue Extension;
- Map 2 – Sections West of Falmouth Road which are outside, but adjacent to, the Growth Area;

- Map 3 – Middle Road north from the intersection with Woods Road to the Cumberland town line; and
- Map 5 – Properties off Eureka Road and Falmouth Road just outside of the Growth Area.

Another reason for the limited effect on average daily flow is the result of the minimum lot size multiplier described in the residential flow section. The minimum lot size multiplier is used before factoring in the percent of buildable land. So, many smaller lots that had just enough land to be subdivided were already anticipated to not be subdivided. The reduction in buildable land only effected large parcels that had a minimum of three times the required land area for subdivision.

Peak hourly flow was only reduced to 96% of the original value. The main reason for the smaller reduction in peak flow than average daily flow is that while flows to a given pump station may be reduced the pumping rate to downstream pump stations is not reduced. Since many of the pump stations pump directly to other pump stations a reduction in peak flow to an upstream pump station does not result in a reduction of peak from that pump station to the downstream pump station. Additionally, peak flows are affected by the change in average daily flows which had a much smaller decrease than the change in buildable land.

As a result of the sensitivity analysis it was determined that the original values for buildable land and lot coverage are conservative but appropriate values for estimating future flows.

SECTION 4

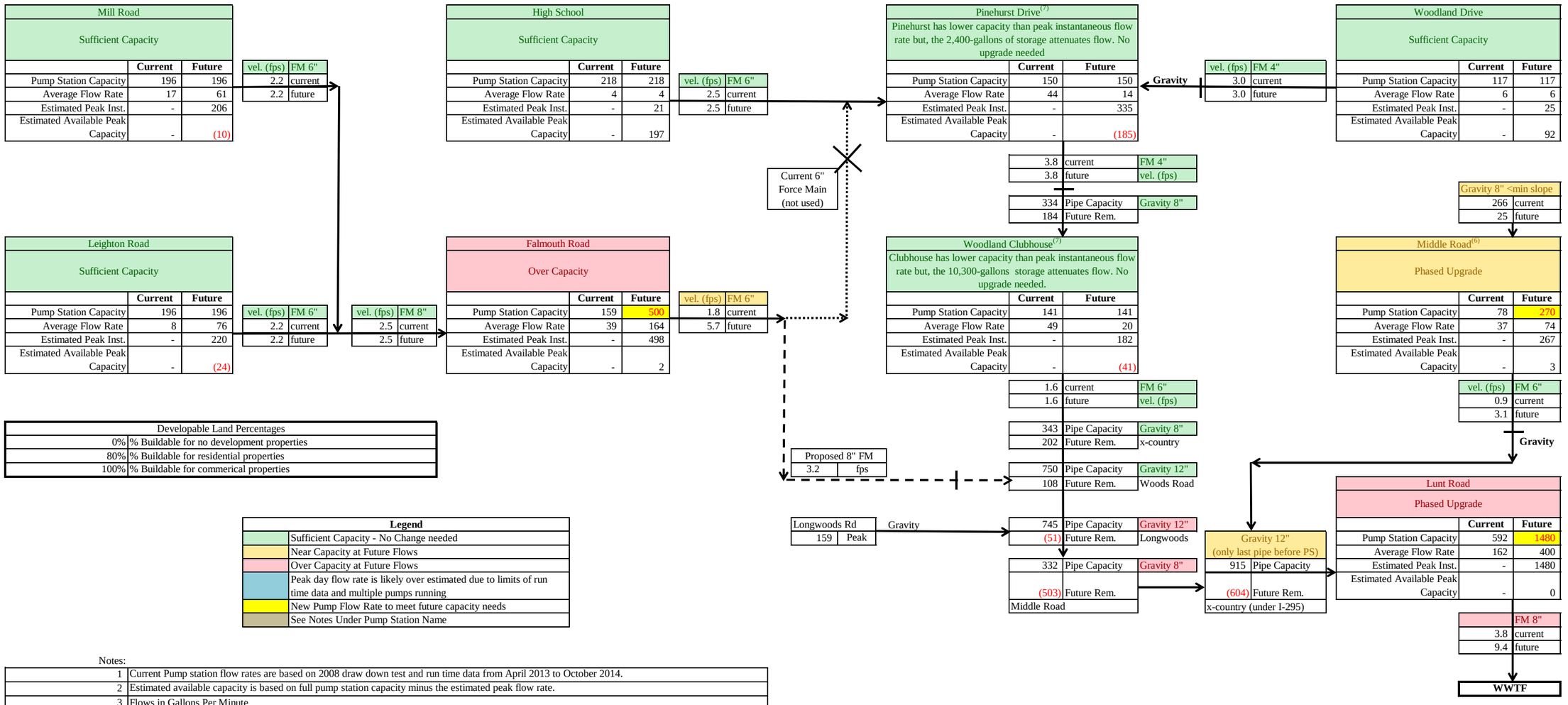
EXISTING INFRASTRUCTURE NEEDS AND COSTS

4.1 PROJECTS

This section summarizes upgrades to the Town's existing collection system required to address existing problems and provide additional capacity for future development. Recommendations for pump stations, interceptors, and the WWTF are included. With the exception of the capacity limitations noted in this section, the existing collector sewers and interceptors have adequate capacity to handle projected future flows.

Figure 4-1 shows the infrastructure schematic for the West Falmouth collection system including flows to the pump stations, force mains, and interceptors. The figure indicates if a capacity upgrade is required at each component of the existing infrastructure.

FIGURE 4-1
Future Flows for West Falmouth Sewer System



Developable Land Percentages	
0%	% Buildable for no development properties
80%	% Buildable for residential properties
100%	% Buildable for commerical properties

Legend	
	Sufficient Capacity - No Change needed
	Near Capacity at Future Flows
	Over Capacity at Future Flows
	Peak day flow rate is likely over estimated due to limits of run time data and multiple pumps running
	New Pump Flow Rate to meet future capacity needs
	See Notes Under Pump Station Name

Notes:

1	Current Pump station flow rates are based on 2008 draw down test and run time data from April 2013 to October 2014.
2	Estimated available capacity is based on full pump station capacity minus the estimated peak flow rate.
3	Flows in Gallons Per Minute
4	Pump station capacity is based on one pump operating
5	Typical velocity range for force mains is 2.5 to 5.5 fps, but exceptions are acceptable in certain applications
6	Middle Road Pump Station and interceptor future flow estimate excludes properties West of Allen Ave Extension
7	Instantaneous Flow rate based on peak upstream pump station(s) flow and peak flow from gravity sewer.
8	Current peak instantaneous flowrate is not available

Lunt Rd. 8" FM	
flow (gpm)	velocity (fps)
592	3.78
860	5.49
900	5.74
1210	7.72

Lunt Rd. 10" FM	
flow (gpm)	velocity (fps)
900	3.68
1300	5.31
1345	5.49

4.1.1 Mill Road Pump Station

Mill Road Pump Station and force main will have sufficient capacity for future flows based on the flow estimate and assuming Project Area 6-2 is directed to Leighton Road Pump Station as shown on Map 6. Figure 4-1 shows a slightly higher flow to the pump station than the pump station capacity but this is likely covered by the conservatism in the flow estimate and would require complete build-out of the service area. If flows did reach this level, cleaning the force main and replacing the impellers might provide the additional capacity needed.

4.1.2 Leighton Road Pump Station

Leighton Road Pump Station and force main will have sufficient capacity for future flow based on the flow estimate. Figure 4-1 shows a slightly higher flow to the pump station than the pump station capacity but this is likely covered by the conservatism in the flow estimate and would require complete build-out of the service area. If flows did reach this level, cleaning the force main and replacing the impellers might provide the additional capacity needed.

4.1.3 Falmouth Road Pump Station

As development increases along Route 100, flows to the Falmouth Road Pump Station will be well over capacity. If the current flow path was maintained; upgrades would be required on the Falmouth Road Pump Station and force main, Pinehurst Drive Pump Station and force main, Woodland Clubhouse and force main, and a small section of 8-inch gravity sewer. To eliminate this compounding effect, it is proposed that the Falmouth Road Pump Station force main be redirected downstream of Pinehurst Drive and Woodland Clubhouse Pump Station to the 12-inch gravity sewer on Woods Road. The pump capacity of Mill Road Pump Station and Leighton Road Pump Station, individually and combined, exceed the capacity of the Falmouth Road Pump Station.

The existing force main would be extended from where it meets the force main for High School Pump Station on Woodville Road. High School Pump Station would continue to use the force main to Pinehurst Drive Pump Station. Multiple routes for the force main were considered:

1. the existing sewer route from Pinehurst Drive to Woodland Drive, with a cross country route through the Clubhouse Property;
2. Pinehurst Drive to Woodland Drive to Woods Road;
3. Woodville Road to Woods Road; and
4. Woodville Road to the CMP easement then along Woods Road.

The fourth option was selected as the proposed route. Map 4 shows the route along Woodville Road through the CMP easement to Woods Road, then along Woods Road were the force main would discharge to a new gravity section before meeting up with the existing sewer. This route is one of the most direct and limits the cost and disturbance of traffic and paving which wouldn't be required in a large section of the route through the CMP easement. The cost of the new force main is estimated at $1,088,000.

The pump station would require an upgrade with new generator, pumps, electrical and instrumentation, and other building improvements. The new pump station would be designed for 500 gpm to handle peak flows from Mill Road and Leighton Road Pump Stations and peak gravity flows. The cost of this upgrade is estimated at $355,000.

The 2009 Pump Station Evaluation recommended a number of architectural, equipment, and electrical/instrumentation upgrades that would not be applicable after a full upgrade of the station.

4.1.4 High School Pump Station

High School Pump Station and force main have capacity that is significantly higher than the future flow projection. Consideration was given to reducing the pump capacity to elevate downstream infrastructure but, rerouting the Falmouth Road Pump Station force main around Pinehurst Pump Station would eliminate the need to reduce flows to Pinehurst Drive Pump Station.

Recommendations from the 2009 Pump Station Evaluation that are still recommended today include electrical upgrades and, replacement of wet well cover and valve pit cover to reduce water infiltration. Cost for this project is estimated at $17,000 (adjusted for inflation).

4.1.5 Woodland Drive Pump Station

Woodland Drive Pump Station and force main will have sufficient capacity for future flow base on the flow estimate.

The 2009 Pump Station Evaluation recommended a number of electrical and instrumentation upgrades as well as the addition of raised manhole frames and covers on the bypass tank and wet well. The telemetry upgrades have already been completed. Cost for the remaining items in this project is estimated at $66,000 (adjusted for inflation).

4.1.6 Pinehurst Drive Pump Station

Pinehurst Drive Pump Station and force main will have sufficient capacity for future flow based on the flow estimate as long as the Falmouth Road force main is redirected downstream of the pump station. Figure 4-1 shows a much higher peak flow to the pump station than the pump station capacity. This is due to the combined pumping rate of High School and Woodland Drive Pump Stations and a small contribution from peak gravity flow. Sustained flows are not expected to be above pump station capacity. Further, the 2,400 gallon storage tank at Pinehurst Drive Pump Station will buffer the higher upstream pumping rates, eliminating the need for a pump station capacity upgrade.

The 2009 Pump Station Evaluation suggested a full pump station upgrade to address future capacity needs. With the redirection of Falmouth Road force main this upgrade will not be needed. The telemetry work outlined as part of that report has been completed. The additional electrical upgrades outlined in the report are estimated to cost $31,000 (adjusted for inflation)

4.1.7 Woodland Clubhouse Pump Station

Woodland Clubhouse Pump Station and force main will have sufficient capacity for future flow based on the flow estimate as long as the Falmouth Road force main is redirected downstream of the pump station. Figure 4-1 shows a higher peak flow to Woodland Clubhouse Pump Station than the pump station capacity. This is due to the upstream pumping rate of Pinehurst Drive Pump Station and a small contribution from peak gravity flow. Sustained flows are not expected to be above pump station capacity. Further, the 10,300 gallons of storage at Woodland Clubhouse Pump Station will buffer the higher upstream pumping rates eliminating the need for a pump station capacity upgrade.

The 2009 Pump Station Evaluation suggested a full pump station upgrade to address future capacity needs. With the redirection of Falmouth Road force main this upgrade will not be needed. Additionally, the instrumentation upgrades suggested in the 2009 report have already been completed. The remaining electrical and instrumentation upgrades outlined in the report are estimated to cost $33,000 (adjusted for inflation).

4.1.8 Middle Road Pump Station

Mill Road Pump Station will be over capacity at the estimated future flows at build-out. The force main has sufficient capacity. The pump station upgrade should include new pumps, and a small building to house new electrical and instrumentation equipment. The new pump station would be designed for 270 gpm to handle peak gravity flows. The cost of this upgrade is estimated at $355,000.

The 2009 Pump Station Evaluation recommended electrical and instrumentation improvements for the station. The instrumentation upgrades have already been completed. Cost for the remaining work is included in the cost estimate above. This cost includes the potential of reusing the existing Lunt Road Pump Station generator to provide emergency power. If a new generator was desired this cost would be additional.

4.1.9 Lunt Road Pump Station

Figure 4-1 shows that Lunt Road Pump Station will need to be upgraded to pump at about 1,480 gallons per minute (gpm) to handle full build-out of West Falmouth which is more than double the current capacity. In addition, the eight inch force main is not large enough to handle this peak flow. A pump station upgrade and force main replacement is recommended. Phasing of this project is suggested to reduce the initial cost and prevent over design of the pump station. The project would be broken into two parts:

1) replacement of the existing pump station, and
2) replacement of the force main.

The pump station upgrade would be designed for the ultimate capacity of 1,480 gpm based on a future ten inch diameter force main which would be provided in Phase II. Using the existing 8-inch force main, the upgraded Lunt Road Pump Station would have a capacity somewhere between 592 gpm and 1480 gpm depending on the specific pumps specified. The pump station upgrade is estimated to cost $1,420,000 to $2,130,000 depending on the type of station and the extent to which existing facilities are reused.

The second phase of the project would take place once flows to the new station reach the capacity of the existing force main. The second phase would involve replacement of the 4,500 foot long force main with new ten inch pipe. The cost estimate for the second phase is $736,000.

The Town should continue to monitor the Lunt Road Pump Station run time data to evaluate remaining capacity and help decide when the first phase of the upgrade should be completed.

4.1.10 Interceptor Section

As mentioned in Section 2.1, the interceptor from the intersection of Longwoods Road and Woods Road, along Middle Road, then cross-country to Lunt Road will need to be replaced. The 4,450 stretch of sewer is eight inch diameter with many sections laid at either minimum slope or less than minimum slope. The project will replace the entire eight inch diameter section from Longwoods Road and Woods Road intersection to the first manhole on Lunt Road with 15-inch

diameter pipe. After that manhole the 8-inch pipe increases to 12-inch diameter pipe and has sufficient capacity except for the last pipe length before Lunt Road Pump Station which is acceptable. The section of pipe is highlighted on Map 2 and Map 3 of Appendix A. The project is estimated at $1,294,000.

4.1.11 WASTEWATER TREATMENT FACILITY

Based upon a May 2013 memorandum to the Town of Falmouth from Wright-Pierce entitled *"Wastewater Treatment Plant Capacity Assessment and Impacts on Future Development/Growth in Falmouth and Cumberland"*, the Town's WWTF has an estimated 500 pounds per day (lbs./day) of organic loading capacity remaining at current peak day flows of 4.25 mgd before supplemental aeration tanks are required for biological treatment. Removal of extraneous ground water and surface water from the collection system (infiltration and inflow or I/I) and a corresponding reduction in peak day flows to the WWTF would increase the available organic loading capacity at the WWTF. This remaining capacity is based upon removing nitrogen down to an effluent level of no less than 8 mg/l. Maine DEP is in the process of establishing nutrient loading criteria for Casco Bay which will require U.S. EPA approval. It is possible that development of these criteria could result in permit limits for Falmouth below 8 mg/l nitrogen which would de-rate the plant capacity, resulting in less than 500 lbs./day of remaining organic capacity.

In the May 2013 memorandum, the remaining 500 lb./day loading to the WWTF was presented in terms of equivalent numbers of new homes and flow – 924 new homes or approximately 145,000 gpd of average daily flow. It is important to note that a corresponding reduction in flow of 145,000 gpd through I-I removal would be required to accommodate these 924 new homes. This remaining capacity is inclusive of both Falmouth and Cumberland. The work completed as part of the sewer master plan has determined that at build out in West Falmouth, an equivalent of over 2,000 homes could be connected to the sewer, likely over several decades. That said, the potential for sewered development in West Falmouth alone (not considering east Falmouth and Cumberland) could produce organic loads and corresponding flows more than double the remaining capacity at the WWTF.

In addition to the organic loading limits at the WWTF, the WWTF has hydraulic limits – the amount of flow the WWTF can accept without impacting plant capacity and, in extreme cases, overtopping tanks and channels. Based upon hydraulic models completed for the WWTF, it is estimated that flows of up to 5.2 mgd can be accepted without impacting treatment performance. This is only about 0.3 mgd (200 gallons per minute) more than the WWTF currently receives from the Mill Creek Pump Station, Clearwater Drive Pump Station and Lunt Road Pump Station during extreme wet weather events.

The design of an upgrade to the Mill Creek Pump Station is currently being undertaken to increase the capacity from 2.5 mgd to 4.2 mgd. Further, this sewer master plan is recommending a more than doubling of the capacity at the Lunt Road Pump Station to 2.1 mgd (1,480 gpm). With these ongoing and proposed upgrades, the future peak flow to the WWTF, should these three pump stations operate concurrently at peak capacity, could be approximately 7.3 mgd, or 2.1 mgd greater than the theoretical hydraulic capacity of the WWTF. Over the short term, the output of the new Mill Creek Pump Station will be limited to ensure flows to the WWTF do not exceed 5.2 mgd, or the actual peak hydraulic capacity of the WWTF that can only be known once flows in excess of 5.2 mgd are pumped to the WWTF. Longer term, hydraulic upgrades will likely need to be implemented at the WWTF and/or large quantities of I-I will need to be removed from the collection system. The extent of the hydraulic improvements at the WWTF will depend upon the success of I-I removal activities at removing flow, as well as the actual pumping capacity required at the upgraded Mill Creek Pump Station and the ultimate capacity selected for the Lunt Road Pump Station.

Lastly, if the increased flows to the WWTF result in the need to re-permit the WWTF for a higher capacity than the current 1.56 mgd of monthly average daily flow, Maine DEP may require that the current side bank discharge of the WWTF into the Presumpscot River be extended to the Route 295 bridge for subsurface discharge into deep water. This extension was evaluated by Wright-Pierce in 2003, but has not been required by Maine DEP at this time.

The estimated cost to add a third aeration basin and other related ancillary items to increase capacity at the WWTF is approximately $2.9 million. The nearly 3,000 foot outfall extension

into the main channel of the Presumpscot River (assuming a further extension into Casco Bay directly is not required) is estimated at approximately $2.25 million. While the extent of the improvements required to increase the hydraulic capacity are unknown at this time, it is conceivable that $500,000 to $1 million could be spent on these improvements, for a total estimated cost of approximately $6 million in WWTF improvements as a result of growth in Falmouth and Cumberland.

SECTION 5
RECOMMENDATIONS

5.1 SEWERING CONSIDERATIONS

The exact future of development and the need for sewer extensions and existing infrastructure upgrades in West Falmouth is unknown at this time. That said, the Long Range Planning Advisory Committee and the Town Planning Office are in the process of implementing changes to zoning within the proposed growth areas in West Falmouth as a result of the 2013 Comprehensive Plan. Further, the Town recently adopted the Route 100 Vision Plan and is currently undertaking preliminary design of road and utility improvements on Route 100.

Given the existing limitations within the existing wastewater conveyance system in West Falmouth, and the wastewater treatment facility, it is prudent to identify and plan for wastewater upgrade projects necessary in West Falmouth to ensure capacity is available before development, especially anticipated development, occurs.

Based upon meetings with Town Staff and LPAC members, the main factors when prioritizing/selecting wastewater improvements in West Falmouth were identified as:

- Consistency with the 2013 Comprehensive Plan;
- General consideration of environmental issues;
- Cost effectiveness.

Each goal is addressed in the paragraphs below.

The study was limited to the lots within the Growth Area outlined in the Comprehensive Plan. So, all sewer extensions identified in Section 3.6 and existing infrastructure needs identified in Section 4 are consistent with the Comprehensive Plan. The flow projections do include some flows from lots just outside of the Growth Area in locations where gravity sewer could be extended easily. These flows are considered because development could occur and downstream infrastructure should be sized to handle those flows in the event that the Growth Area or zoning changes in the future. Sewer extensions are not shown to these areas because development of these lots is not encouraged by the Comprehensive Plan.

The main purpose of sewer extension is to protect public and environmental health. Based on a discussion with Town Staff, it was determined that there weren't any known wide spread environmental issues caused by sewer and no particular sensitive environmental issues that would drive extension of sewer. In addition, Town Staff did not identify any known areas with high rates of septic failure. Within the Growth Area there aren't any known significant environmental drivers to encourage sewer extension to one area or another.

The issue of cost effectiveness of each project is described in Section 5.2.

5.2 ANTICIPATED DEVELOPMENT AREAS

Unless there is a strong driver for the Town to extend sewer, such as for health and safety reasons or to encourage economic growth, extensions are typically funded and completed by developers which receive a benefit (higher development density) for the cost of extending the sewer. The Town is unlikely to choose to extend sewer which means sewer extensions will be based on the feasibility of sewer extension for developers. This is difficult to predict since each developer will have their own goals and resources to make the decision for sewer extension; as well as specific lots they own in random locations in the Growth Area. The Town has identified a few areas that have lots which are likely for development and sewer extension:

1. Lots served by existing sewer that are not fully built out or homes on roads with sewers that are not currently connected;
2. Route 100 from Portland North to Mountain Road;
3. Existing planned development including the large lots located on Longwoods Road at the edge of the Growth Area.

If the Town wanted to extend sewers in a particular area, these extensions could be included as part of road reconstruction projects to reduce costs, and share the cost across more than one Town department/enterprise fund. There are mechanisms within the Town's Sewer use ordinance that allows the Town to fund part or all of a sewer extension if it is in the Town's interest.

5.3 PRIORITY OF EXISTING INFRASTRUCTURE REPLACEMENT

Projects for the replacement of the existing infrastructure have been ordered based on the sewering considerations and anticipated development areas. This section outlines a proposed order for infrastructure projects including phasing of projects were practical. Which areas will be developed and, which areas will be developed first, is unknown. Project order was based on the most likely development area (listed above) and the most limiting section of the collections system being addressed first.

Existing infrastructure needs and costs are discussed in Section 4 and recommendations are included in Section 5. In brief, the following infrastructure projects in West Falmouth are recommended:

1. Replace existing 8-inch diameter gravity sewer on Middle Road from Turnpike Spur to just upstream of Lunt Road Pump Station with 15-inch diameter gravity sewer
2. Increase pumping capacity of Falmouth Road Pump Station and reroute/extend force main from Woodville Road to Woods Road
3. Phase I Upgrade to Lunt Road Pump Station to increase pumping capacity
4. Upgrade to Middle Road Pump Station to increase capacity (if needed pending growth)
5. Phase II Upgrade to Lunt Road Pump Station for increase capacity by upsizing force main (if needed pending growth)

The cost of these improvements is estimated to cost between $3.7 million and $4.2 million for Projects 1 through 3 above. Projects 4 and 5 are expected to cost an additional $1.1 million, if needed.

SECTION 6
REVIEW OF SEWER USE ORDINANCE, CURRENT WASTEWATER FUNDING AND OTHER FUNDING ALTERNATIVES

6.1 REVIEW OF SEWER USE ORDINANCE

As part of the development of the West Falmouth Sewer Master Plan, the Town's current sewer use ordinance was reviewed to determine if updates should be considered in light of the Sewer Master Plan recommendations. The suggestions below only pertain to the recommendations from the Sewer Master Plan, and other updates may be prudent to clarify certain sections.

Section 18-92. Same—Hearings and Section 18-120. Required

These two sections should be modified to create clear language for the requirement of existing homes and properties to connect to existing sewer.

Most of the existing sewer in West Falmouth is already within the Growth Area. The planned zoning changes within the Growth Area may encourage additional development. It is in the Town's interest both environmentally and economically for existing homes to connect to the sewer. Providing clear and concise language for the requirements of connecting to the sewer will make decisions by the Town easier to enforce/defend.

Section 18-121. New Public Sewers

This section should be simplified to clearly define which homes must connect to the sewer and which homes qualify for a waiver, and the process for obtaining a waiver.

As sewer extensions occur in West Falmouth, it will be important to maintain clear and consistent guidelines for who must connect to the sewer. This section will become increasingly important for planning of future developments by allowing the Town to see which extensions provide the most benefit. For example, if the Town chooses to extend sewer into a new area and

ambiguity in the Sewer use ordinance allows existing homes to not connect, it may reduce the environmental and economic benefit to the Town.

Section 18-131. Connection Charges; Permit Fees; Accounting

Section (a) should be adjusted to include language that indicates a change in use on a property resulting in an increase in flow would also require new permit fees. This situation could be more prevalent as commercial development occurs along Route 100 with redevelopment of existing properties. One example is the redevelopment of an existing warehouse to a brewery.

Section (b) This section should be modified to link permit fees to the equity value of the sewer system, and the user's expected use of the system by establishing a dollar per gallon fee. This type of equity buy in fee structure is generally considered "fair" and "defensible." There are three well recognized systems for developing connection fee, also known as system development charges. They are:

- New customers "buy-in" to existing system facilities – most suitable for systems with adequate capacity for existing and future users
- New customers are responsible for latest capacity increases that are being constructed – most suitable for large projects aimed to serve new growth
- New customers "buy-in" to existing facilities on an equitable basis plus pay for new equity share basis of new facilities to avoid increase rates to existing users.

In any of these systems, selecting the method used to determine the system valuation (original cost, replacement cost, etc.) and the capacity of the existing system(s) is critical to calculating an appropriate cost per unit volume buy-in fee.

Section 18-231. Private Extensions to the Public Sewer

Wording should be added to this section indicating that private extensions shall be constructed to Town specifications and with the agreement that a sewer so constructed, and meeting the requirements of Section 18-232, will be conveyed to the Town upon satisfactory completion.

These revisions will ensure that sewer extensions be constructed in a way that is beneficial to the Town.

Section 18-232. Acceptance of Private Extensions to the Public Sewer

This section should include a requirement that sewer extensions be constructed within the accepted public ways or easements acceptable to the Town.

The Town may also wish, either in the sewer use ordinance or other document, to reference the completed sewer master plan as best representing the Town's policy towards sewer extension and the capital upgrades necessary to support such extensions in West Falmouth.

Section 18-233. Exemption from connection charges

It is our understanding that the exemption established by this section of the ordinance has not been consistently administered. We expect that the intent of the exemption is to provide some offset in recognition of a developer's cost to extend sewer. Should the Town elect to establish a connection fee based on equity and use the system, a thorough review of the circumstances or conditions permitting an exemption from those fees is recommended.

6.2 CURRENT WASTEWATER FUNDING

The Town of Falmouth operates the wastewater collection, pumping and treatment system as an enterprise fund; that is, the costs to operate, maintain, and perform capital upgrades to the system are funded by the system users, not the entire tax base of Falmouth. Proportionate shares of the revenue come from residential and commercial users, with smaller amounts derived from connection and septage disposal fees. The Town of Falmouth rate payers, as well as the Portland Water District through an agreement with Falmouth and Cumberland, has funded the bulk of capital improvements within the wastewater system over the past 35 years. Additionally, some of the infrastructure, such as several pump stations and sewer extensions, were designed and constructed by private developers with ownership and responsibility for operation and maintenance turned over to the Town.

This report does not include a recommendation for who should plan, design, construct and fund any of the infrastructure improvements or sewer extensions. That decision should be made by the Town Council. That said, it is reasonable to assume that private developers will be responsible for costs associated with the construction of sewers and pump stations to serve new development. The facilities should be constructed to meet Town standards and in accordance with the recommendations within this sewer master plan. Typically, sewers, pump stations and force mains constructed in the Town right-of-ways or easements would be accepted as Town-owned at the successful completion of the project. Modifications to the Sewer use ordinance are recommended in Section 6.1 to help encourage this process.

In general, Town's or Sewer Districts do not participate in funding projects that serve existing residential neighborhoods that are currently served by on-lot subsurface disposal systems unless there are substantial environmental concerns. If these projects are constructed, property owners that are served typically fund the projects through a special assessment by the Town.

6.3 OTHER FUNDING ALTERNATIVES

There are a number of funding alternatives available for the recommended projects outlined in this West Falmouth Sewer Master Plan. Some of the alternatives described below are currently utilized by the Town.

6.3.1 Sewer User Charge (Sewer Service Charges)

The Town currently assesses a sewer user charge, also known as a sewer service charge, to all sewer users to pay for all of the annual operating, maintenance and capital expenses of the collection and treatment facilities in Falmouth.

Under Section 18-160 of the Town's ordinance, service charges must provide as a minimum the "source of not less than ninety (90) percent of the revenues needed for retiring debt service, capital expenditure, operation, and maintenance of the sewage works".

6.3.2 Sewer Connection Charge

Any time a new sewer user connects to the existing collection system, the Town assesses a sewer connection charge. The purpose of the connection charge, or connection fee, is to ensure that new users "purchase" their portion of the existing wastewater infrastructure which was funded by others. Since this fee is intended for buy in to existing infrastructure, it is not recommended that these funds be used to fund sewer extension projects, but would be used for upgrades to existing facilities. Alternatives mechanisms for establishing connection fees or system development charges, was discussed previously in Section 6.1.

Per Section 18-131, c. of the town's ordinance, funds derived from these fees "shall be placed in a separate fund for future sewer construction, sewer debt retirement, contributions to sewer capital costs and any other sewer-related purposes which do not conflict with the Clean Water Act, 33 U.S.C. § 1251 et seq., or its successor provisions and applicable federal regulations."

6.3.3 Sewer Extension by Public Contract

Section 18-230 of the existing Sewer User Ordinance allows for extension of sewer by public contract if the majority of benefiting parties petition the Town. Typically funding for this type of project is provided by the benefitted users through a special assessment. This funding mechanism is commonly used to pay for sewer projects in areas that are already developed and served by on-lot subsurface disposal systems. There are many ways to determine the special assessment, but essentially, the capital cost of the project is divided among the properties to be served by the sewer extension. The fee could be based on the road frontage of the each lot, the square footage of the house, the acreage of each lot, the number of bedrooms in each home, the projected average daily flow from each lot or other factors. The method used to calculate the cost per property may vary depending on the specific characteristics of each project area. Payments for the cost assessed to each property owners would typically be spread out over the term of the bond and a lien is typically placed on the property until the project costs are paid in full.

6.3.4 Private Extension to the Public Sewer

Section 18-231 of the Sewer use ordinance allows for private extension of the public sewer. This option is much like Sewer Extension by Public Contract but the Town does not have a direct connection between the property owners and the contractor performing the work. Language changes to this section of the Sewer use ordinance are referenced in Section 6.1 above to require sewers be constructed in accordance with Town specifications. If the Town desired, additional language could be added to this section to allow for developer reimbursement.

6.3.5 State Revolving Loan Fund (SRF)

Maine Department of Environmental Protection (DEP) administers the Clean Water SRF loan program which provides loans for wastewater projects at a subsidized interest rate as well as the possibility of grant in the form of principal forgiveness. In order to qualify for an SRF loan, a project (or projects) must be placed on DEP project priority list which is updated annually. The SRF loan has some eligibility requirements such as builders on construction contracts are required to solicit quotes from disadvantaged business enterprises (DBE), adhere to federal wage

rates, and comply with the requirements of American Iron and Steel. More recently, supplemental requirements such as the development of a Fiscal Sustainability Plan or Asset Management Plan, is required. The Town is currently using SRF funds to pay for a major upgrade to the Mill Creek Pump Station and force main.

6.3.6 Ad Valorem Taxes

Another alternative for funding sewer extension projects is through taxation. Occasionally, sewer extension projects are required to serve a public facility such as a school, a library or a fire station or to improve an environmentally compromised area. Another example would be the extension of sewer or improvements to sewer infrastructure to serve an area targeted for economic development which would benefit the Town. As the project benefits the entire Town rather than just a select area, the Town may choose to pay the debt service through taxation rather than placing the burden on just the existing sewer user base. Ad valorem taxes are not a common approach for wastewater facilities, but there are some municipalities that use this alternative.

6.3.7 Tax Increment Financing

Similar to taxes, TIF proceeds could provide another source of wholly or partially funding planned sewer improvements, if desirable and justified by broad benefit to the town as a whole.

6.3.8 Grants

Falmouth has not generally qualified for “needs” based grant programs for capital projects funded through State programs. Falmouth does anticipate that Maine DEP will provide $100,000 in principal forgiveness towards planned upgrades at Mill Creek pump station in return for the department agreeing to fund future capital plans at certain levels and meet other asset management commitments.

Appendix A

PROJECT AREA MAPS

Middle Road
Pump Station
Area excluded from
flow estimate
MAYFLOWER RD
LOWER FALLS RD
STAPLEFORD DR
STONECREST DR
SURREY LN
BRIDLE PATH
ASTER LN
WINDING RIVER LN
CARRIAGE RD
PLEASANT HILL RD
ALLEN AVE EXT
RIVER PL
MACCABE RD
PINE RD
INTERSTATE
SWEET FERN LN
WILLIAM WAY
BARRE WAY
REBECCA WAY
SLOCUM DR
HEDGEWOOD DR
JAMESON DR
High Point
Low Point
Sewer Manhole
Sewer Pump Station
Potential Gravity Main
Ground Slope
Sewer Force Main
Sewer Gravity Main by Diameter
6" and Under
8"
10"-12"
Growth Area
Conservation Land
Area Excluded From Flow Estimate
0
150
300
Feet
N
Data Source: Town of Falmouth, Maine
CLM W:\GIS Development\Projects\ME\Falmouth\13014A WFalmouthSewerPlan\MXDs\Fig01 WFalmouth Mapbook.mxd
Town of Falmouth, Maine
Sewer Map
PROJ NO: 13014A
DATE: June 2017
FIGURE:
1
WRIGHT-PIERCE
Engineering a Better Environment

Town of Falmouth, Maine

Sewer Map

PROJ NO: 13014A	DATE: June 2017	FIGURE: 2

WRIGHT-PIERCE
Engineering a Better Environment

Town of Falmouth, Maine

Sewer Map

PROJ NO: 13014A | DATE: June 2017 | FIGURE: 3

Wright-Pierce
Engineering a Better Environment

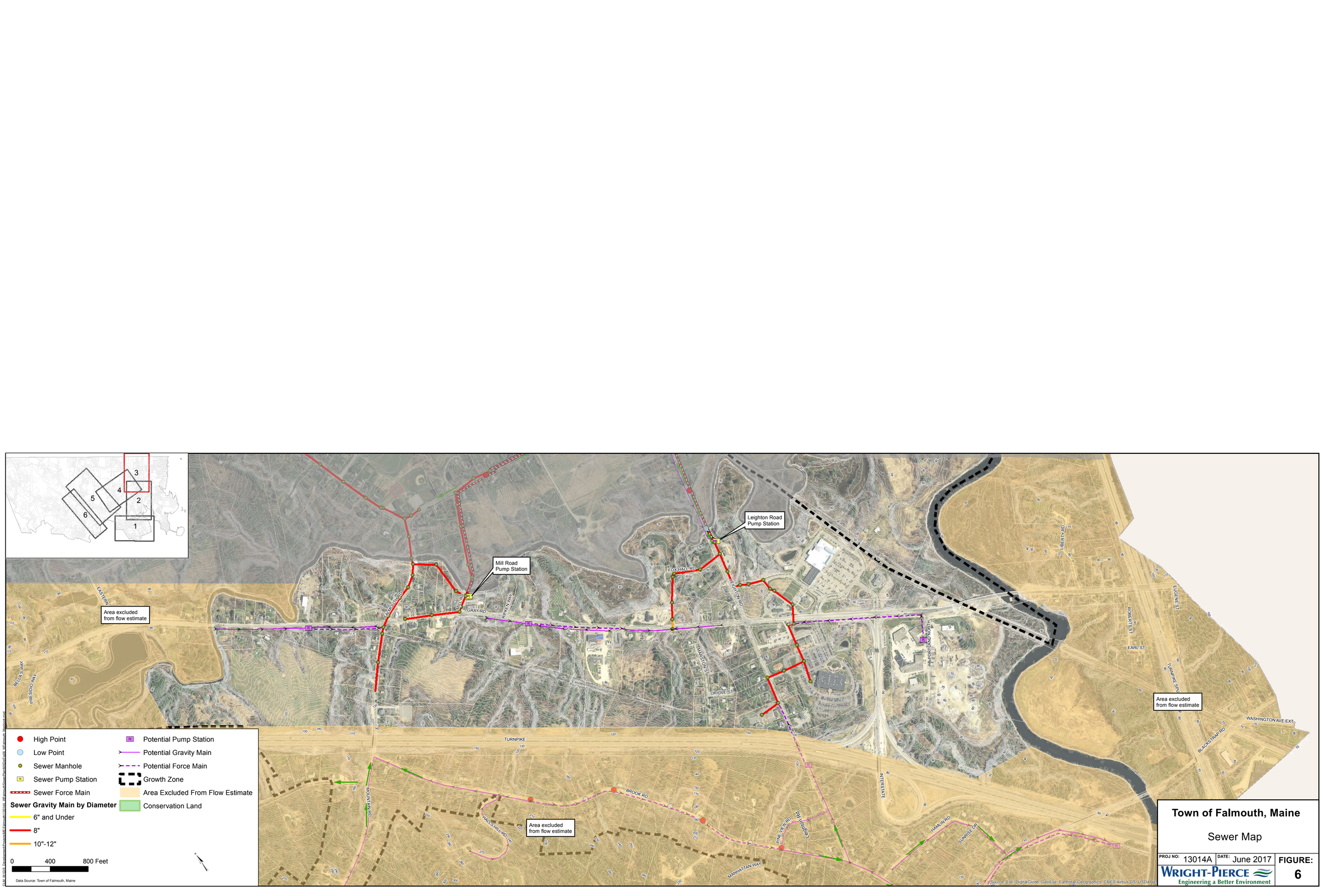
Town of Falmouth, Maine

Sewer Map

PROJ NO: 13014A	DATE: June 2017	FIGURE: 4

Wright-Pierce
Engineering a Better Environment


Pinehurst Drive Pump Station
Woodland Drive Pump Station
Cherrywood Lane Pump Station
Lindenwood Lane Pump Station
High School Pump Station
Falmouth Road Pump Station
Existing low pressure sewer
Leighton Road Pump Station
Mill Road Pump Station
FIELD RD
High Point
Low Point
Sewer Manhole
Sewer Pump Station
Potential Pump Station
Potential Gravity Main
Potential Force Main
Ground Slope
Sewer Force Main
Sewer Gravity Main by Diameter
6" and Under
8"
10"-12"
Growth Area
Conservation Land
0 200 400 Feet
Data Source: Town of Falmouth, Maine
Town of Falmouth, Maine
Sewer Map
PROJ NO: 13014A
DATE: June 2017
FIGURE: 5
WRIGHT-PIERCE
Engineering a Better Environment



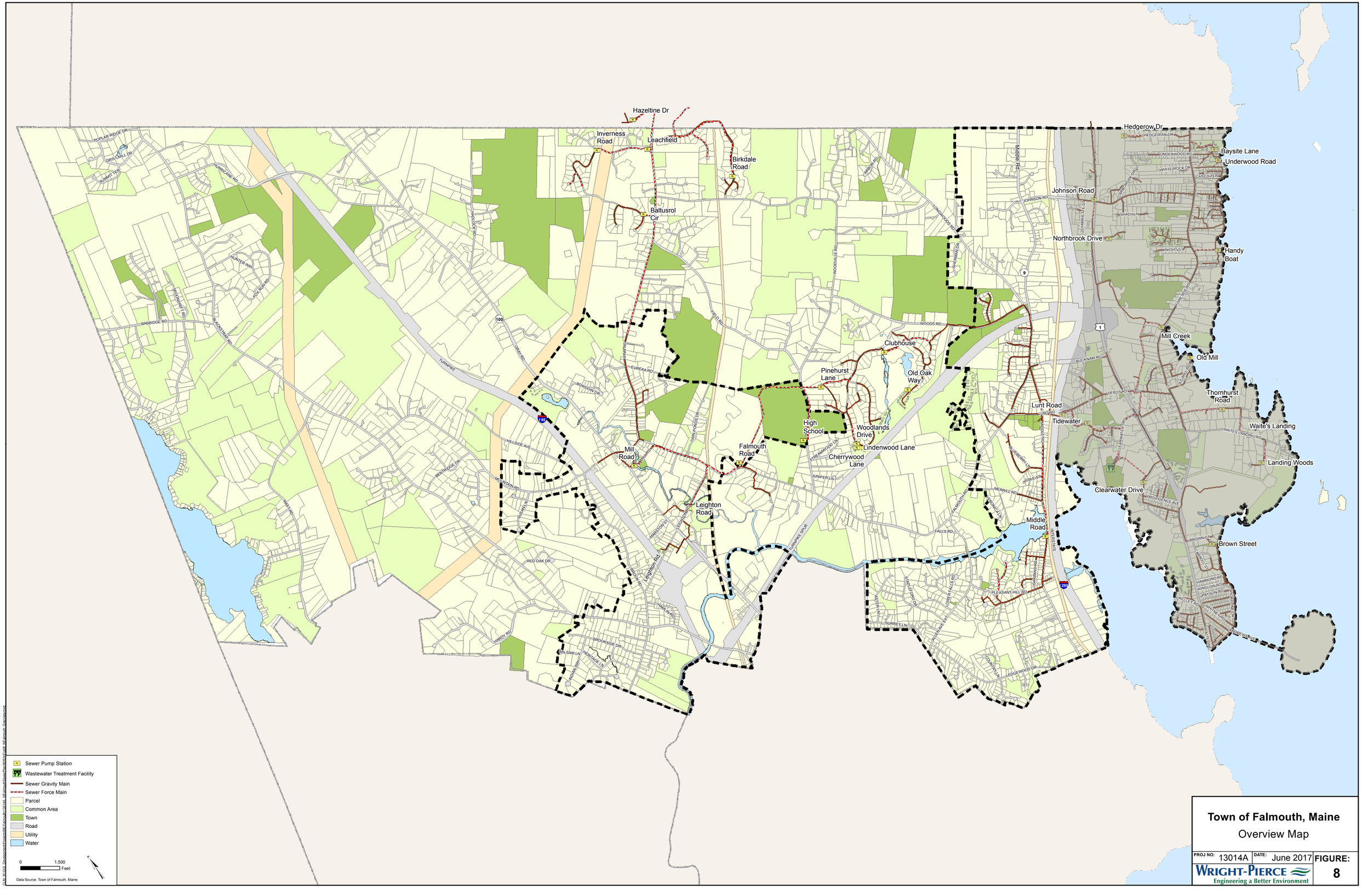
Town of Falmouth, Maine

Sewer Map

PROJ NO:	DATE:	FIGURE:
13014A	June 2017	6

WRIGHT-PIERCE
Engineering a Better Environment

Hazeltine Dr
Inverness Road
Leachfield
Birkdale Road
Baltusrol Cir
Hedgerow Dr
Baysite Lane
Underwood Road
Johnson Road
Middle Rd
Northbrook Drive
Handy Boat
Mill Creek
Old Mill
Thornhurst Road
Lunt Road
Tidewater
Waite's Landing
Landing Woods
Clearwater Drive
Brown Street
Clubhouse
Pinehurst Lane
Old Oak Way
High School
Woodlands Drive
Lindenwood Lane
Falmouth Road
Cherrywood Lane
Mill Road
Leighton Road
Middle Road
1
2
3
4
5
6
Sewer Pump Station
Wastewater Treatment Facility
Sewer Gravity Main
Sewer Force Main
Parcel
Common Area
Town
Road
Utility
Water
Growth Zones
Map Index
0
1,500
Feet
Data Source: Town of Falmouth, Maine
Town of Falmouth, Maine
Index Map
PROJ NO: 13014A
DATE: June 2017
FIGURE: 7
WRIGHT-PIERCE
Engineering a Better Environment



Town of Falmouth, Maine

Overview Map

PROJ NO:	13014A	DATE:	June 2017	FIGURE:
WRIGHT-PIERCE Engineering a Better Environment				8

WRIGHT-PIERCE

Engineering a Better Environment